APRIL, 1953—FIFTY-NINTH YEAR

MACHINERY

The Original... Fafnir Wide Inner Ring Ball Bearing with Self-Locking Collar and Mechani-Seals.

Counterbored, eccentric cam, mated construction of collar and inner ring assures positive locking action, without set screws, lock nuts or adapters.

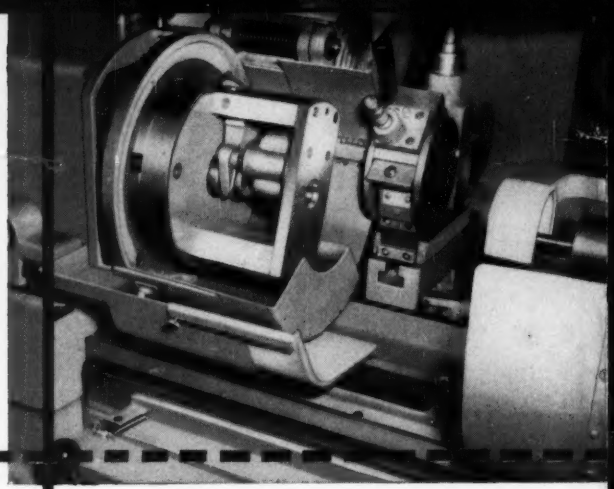
FAFNIR
BALL BEARINGS

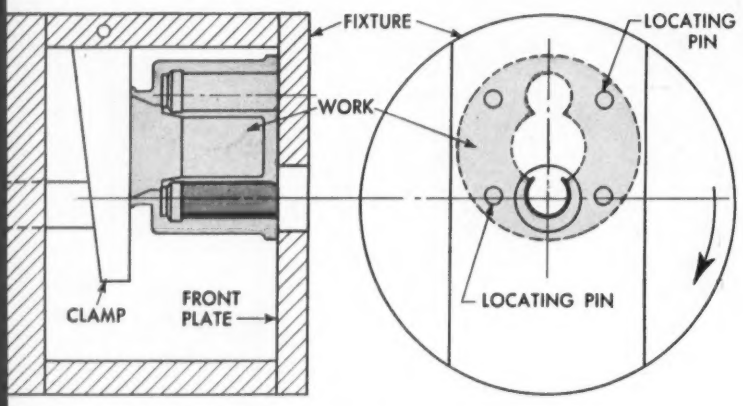
THE MOST COMPLETE LINE IN AMERICA

THE FAFNIR BEARING COMPANY New Britain, Conn.

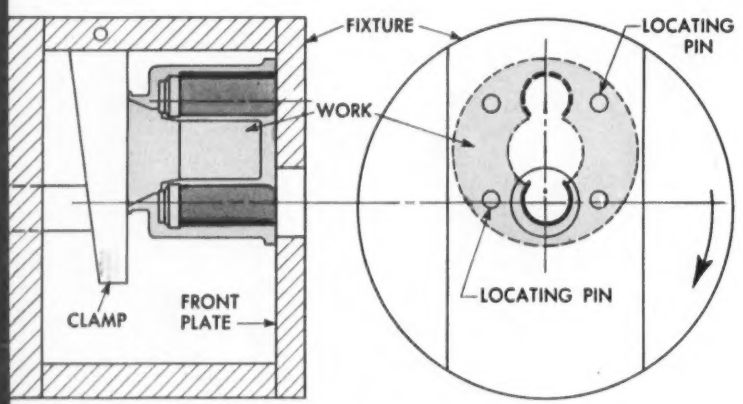
Heald Model 271 Size-Matic grinds

TWO OFF-CENTER BORES





Here part has been turned 180° in fixture and the second open-sided bore has been ground.



Side and end view of clamping fixture with universal joint body in place. Color indicates surface ground in first operation.

Universal joint body with double, open-sided bore, turned 180° in fixture for secondary grind

You can't grind two off-center holes in a rotating part at the same time. So you grind them in sequence. In such cases, it's important to have a work-holding fixture that permits fast, easy relocation of the part for the secondary grind. Here's a typical example.

The machine, a model 271 Size-Matic, is designed for precision internal grinding of double open-sided bores in universal joint bodies. The work is hydraulically clamped in a quick-change, balloon type fixture. After the first bore is ground, the part is simply unclamped, turned 180° in the fixture, reclamped and ground on the second bore. Note that the holes are open on one side, giving an interrupted surface for the grinding operation.

The part locates against the flange face and on pins through holes in the part.

Remember—when it comes to precision finishing, it pays to come to Heald.

HEALD

Case Study No. 2236-97 in **PRECISION PRODUCTION**

INTERNAL AND ROTARY SURFACE GRINDING MACHINES AND BORE-MATIC

THE HEALD MACHINE COMPANY

WORCESTER 6, MASSACHUSETTS

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MACHINERY

VOLUME 59 APRIL, 1953 NUMBER 8

The Monthly Magazine of Engineering and Production in the Manufacture of Metal Products

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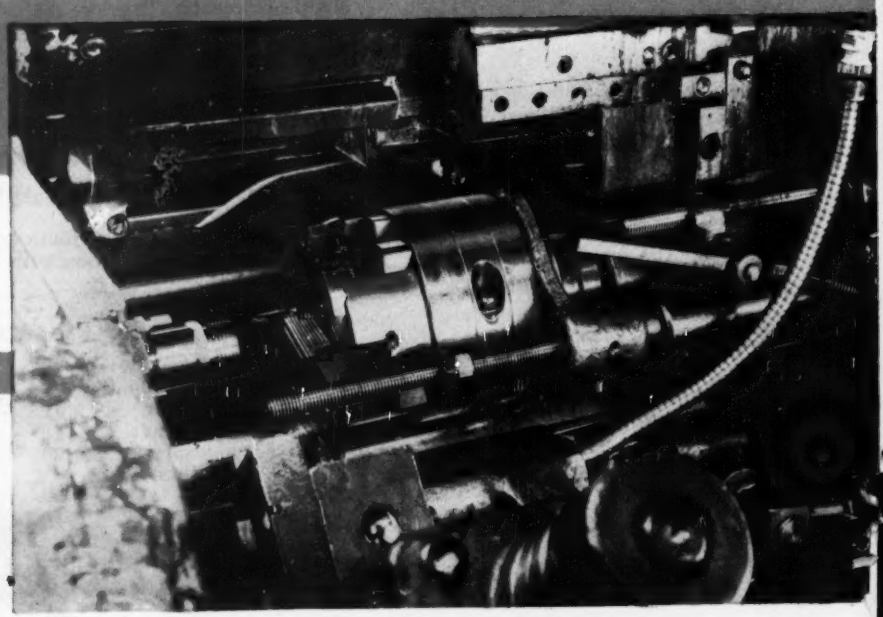
For EXTERNAL THREADING BY "Automatics"

LANDEX HEADS Feature Wide Range, Compact Design



WORLD'S

The

● A 1¼" JX LANDEX Head on a 1¾" Warner & Swasey Automatic is shown threading ¾" Press-Lock spuds. 1" Straight Pipe threads are cut on B-1113 steel, with an average of 3000 pieces threaded between chaser grinds. These spuds are one of the many types of industrial hose couplings and valves produced by the Dixon Valve and Coupling Company of Philadelphia.

The LANDEX is a yoke-operated head compactly designed for use on live-spindle machines where die head clearance is limited. They are built in ½", 13/16", 1¼", and 2" sizes, and each size will cut a wide range of thread diameters. For example, the 1¼" LANDEX shown will cut threads ¼" to 1¼" in diameter, and oversize chaser holders (available for all LANDEX JX Heads) will allow cutting thread diameters up to 2¾".

Write for Bulletin F-90.

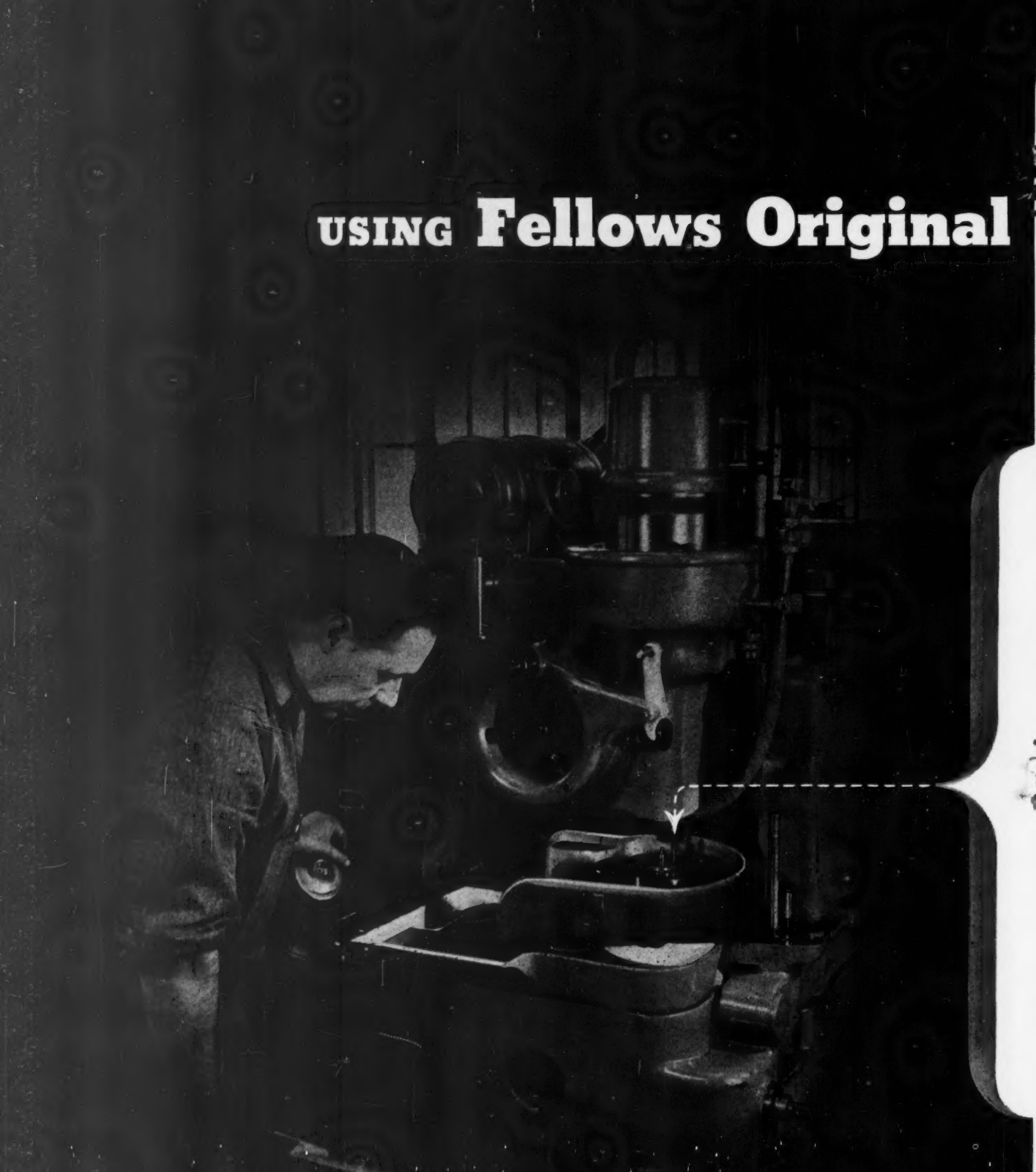
LARGEST EXCLUSIVE MANUFACTURERS OF THREAD GENERATING EQUIPMENT

LANDIS *Machine* COMPANY

WAYNESBORO • PENNSYLVANIA • U.S.A.

348-C

USING Fellows Original

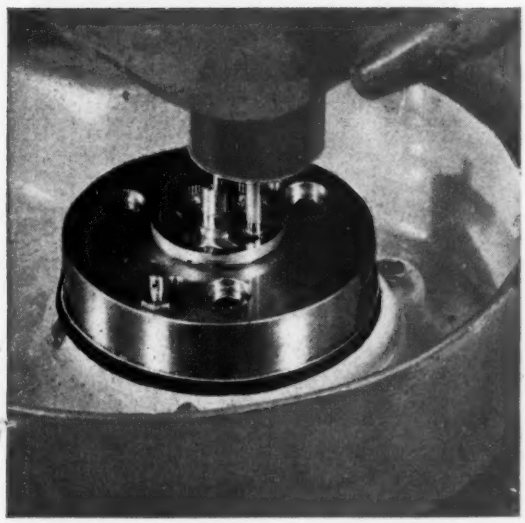


GEAR SHAPERS
SHAVING MACHINES
THREAD GENERATORS
CUTTERS AND SHAVING TOOLS
GEAR INSPECTION INSTRUMENTS

PLASTICS MOLDING MACHINES

Cutters . . .

CONTROL INSTRUMENT COMPANY KEEPS REJECTS "well under 1%"



PRODUCTION DATA

Number of Teeth (Cutter) (Limited by projecting hub)	18
Number of Teeth (Gear)	96
Pitch	48
Pressure Angle	20°
Pitch Diameter	2.000 (+.002; −.000)
Run Out (Total Indicator Reading)	.001
Number of Cuts	2
Production Time (2 Cuts)	90 minutes
Blank Material	4140 Chrome Moly Steel

Control Instrument Company of Brooklyn, New York, uses a Fellows 7-Type Gear Shaper to cut this 2.000″ pitch diameter internal gear for a military fire-control device.

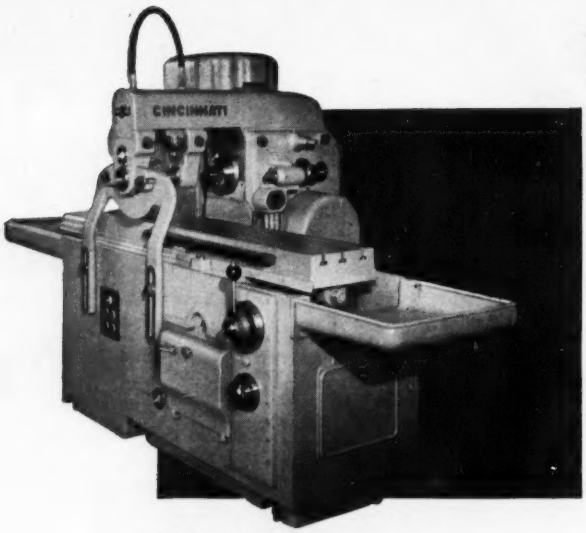
Using original Fellows cutters for both rough and finish cuts of this 4140 Chrome Moly steel, the number of rejects is exceedingly small. Control Instrument Company says, "... using Fellows cutters, our rejects are well under 1%."

The versatile Fellows 7-Type is the most widely used size in Fellows' complete line of Gear Shapers which generate gears from 1/16″ to 120″ diameter. It offers precision and high production on external gears up to 7″ and internal gears up to 6″ pitch diameter and 2″ face width. Set-up is simple, and changeover on production runs is quick.

For helpful information on cutting coarse or fine pitch gears, cams, ratchet teeth, interrupted profiles, segment gears, face gears, racks, and other unusual, high quality gears—just write, wire or 'phone the Fellows office nearest you.

Fellows

THE FELLOWS GEAR SHAPER COMPANY • Head Office and Export Department • 78 River Street, Springfield, Vermont
Branch Offices: 323 Fisher Bldg., Detroit 2 • 5835 West North Avenue, Chicago 39 • 2206 Empire State Bldg., New York 1



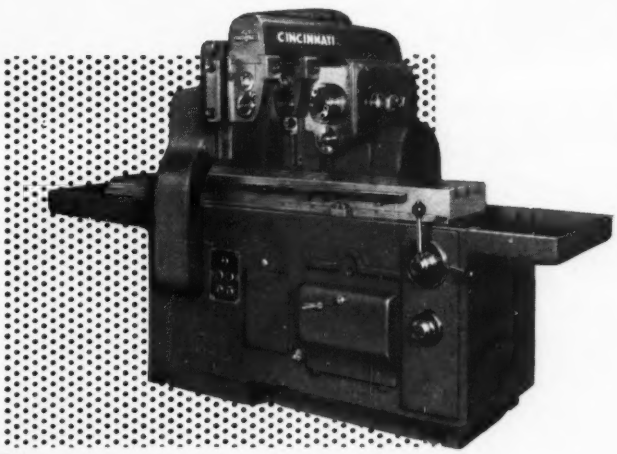
Plain style, new CINCINNATI No. 2-24 Automatic Milling Machine

new

Duplex style, new CINCINNATI No. 2-24 Automatic Milling Machine

MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES • METAL FORMING MACHINES • FLAME HARDENING

new...the cincinnati no. 2-24



Plain Rise and Fall style, new CINCINNATI No. 2-24 Automatic Milling Machine

You can always look to Cincinnati Milling for the finest in machine tools. Cincinnati's newest is the No. 2-24 Automatic, an outstanding example of fine engineering and workmanship, combining advanced production features and easier, more convenient means of setting up the job. ¶ There are three styles: Plain, Duplex, and Plain Rise and Fall. All have two-way table feed cycles with cycle selector control; automatic backlash eliminator; automatic spindle stop; Dynapoise overarm. You may obtain complete information by writing for 28-page catalog No. M-1760. Brief data in Sweet's Catalog File for Mechanical Industries.

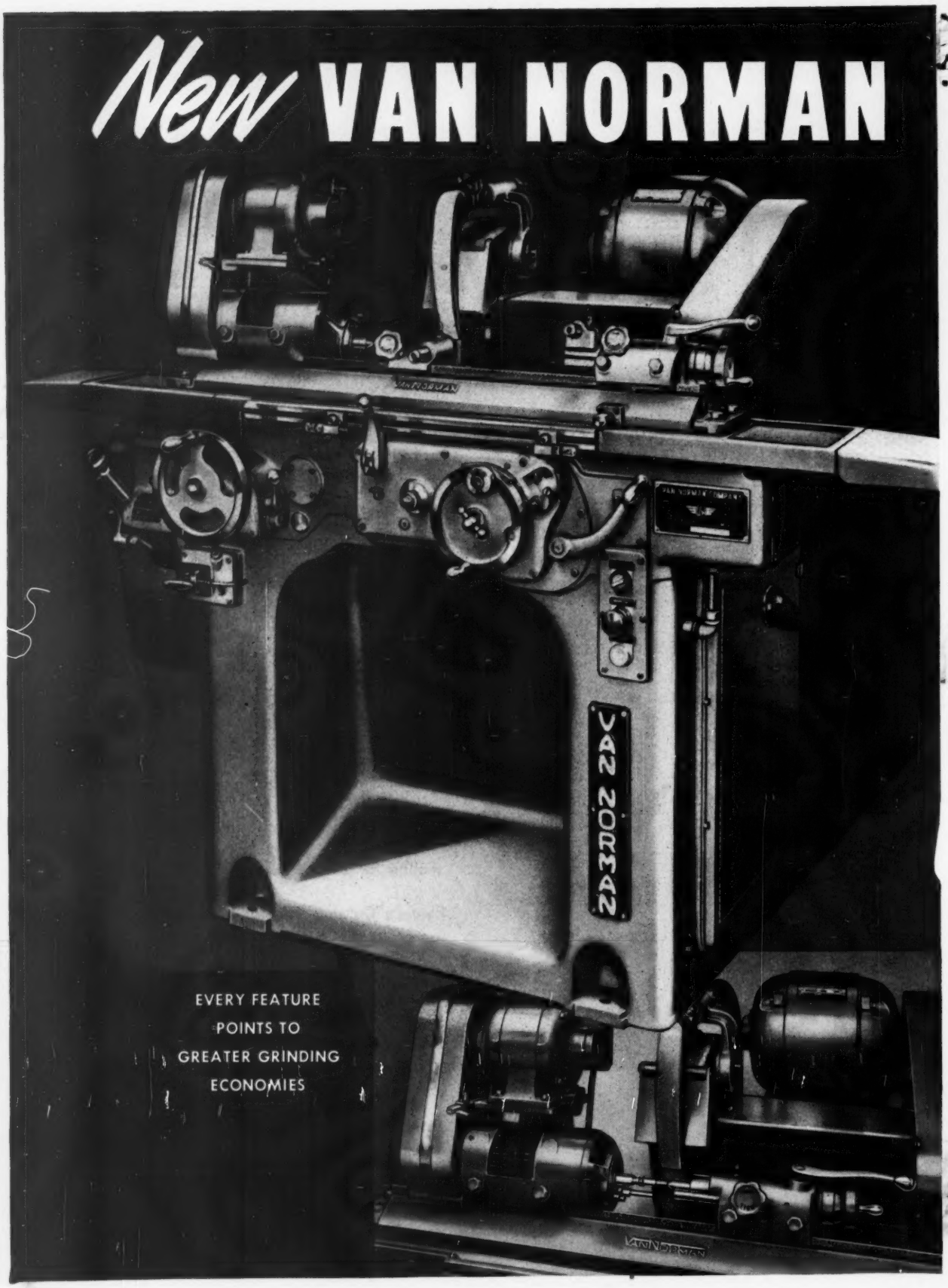
new

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

CINCINNATI

MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

CINCINNATI


New VAN NORMAN
EVERY FEATURE
POINTS TO
GREATER GRINDING
ECONOMIES

418 Cylindrical Grinder

Engineered to Save Time...Reduce Costs

Of Short-Run or Production Grinding of Small Parts!

Here's the *new* Van Norman Cylindrical Grinder that is making history in fast precision traverse or plunge grinding of small parts. Quick to set-up, easy to operate, this grinder cuts grinding costs in toolrooms, job shops or machine shops.

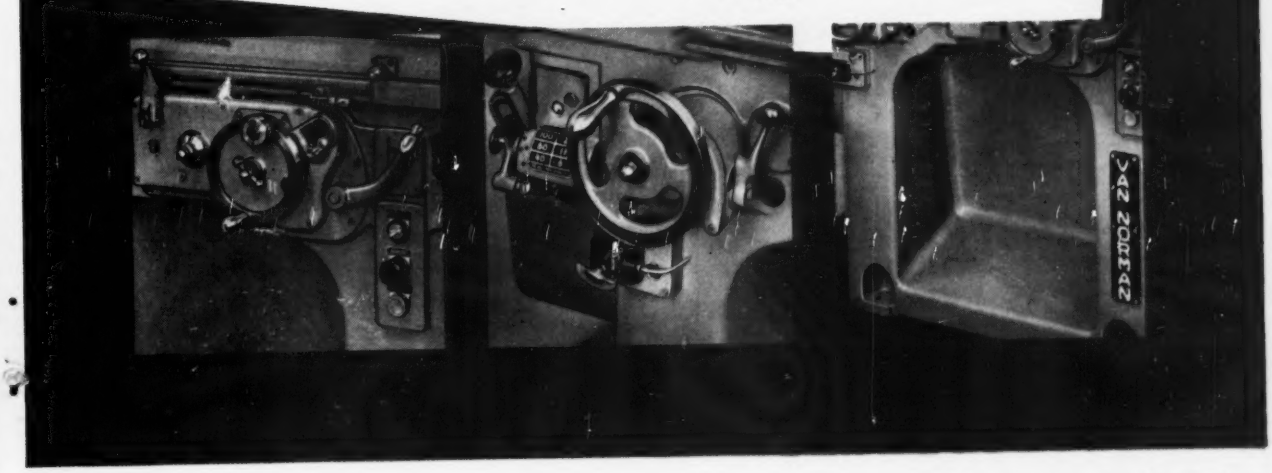
The 418 Grinder is especially designed for ease of operation. Recessed base design permits operator to sit or stand comfortably at the machine. Heavy-duty quality construction throughout assures smooth accurate finish.

COMPARE THESE ADDITIONAL ADVANTAGES

- *Pope wheel spindle equipped with heavy-duty SKF double row cylindrical roller bearings.*
- *Single lever control for rapid traverse and plunge grinding*
- *Rugged base, wide table bearing ways, separate motor drives for wheel spindle, table and headstock*
- *Minimum floor space needed, only 43½" x 79¼"*

Find out how you can increase production output of grinding small parts. Ask about the price, too... *it's exceptionally low* for such a high quality machine. Write:

VAN NORMAN COMPANY
SPRINGFIELD 7, MASSACHUSETTS, U. S. A.



6 Cost Cutting Ideas with Modern Landis Plain Grinders

Landis tooling combines grinding operations . . . cuts cost per finished piece

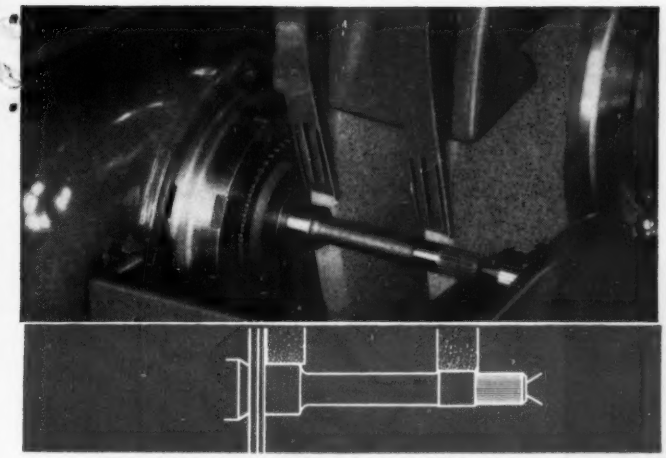
155

10" x 18" Landis Type CH Plain Hydraulic Grinder

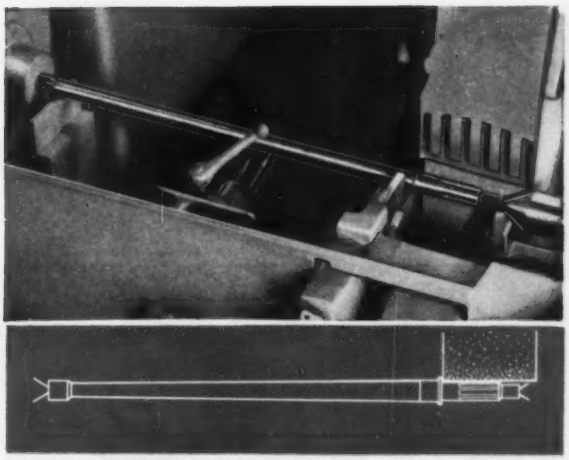
These are typical examples showing why cost conscious production men depend on modern Landis Grinders to lower cost per finished piece. Send prints of your work pieces for production and tooling estimates. Landis Tool Company, Waynesboro, Pennsylvania.

LANDIS

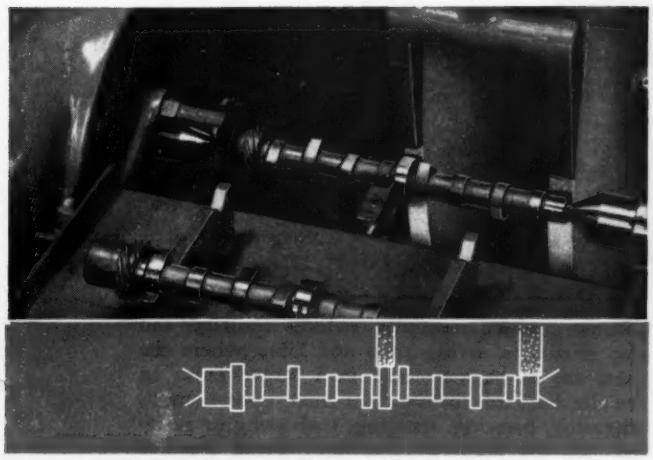
precision grinders



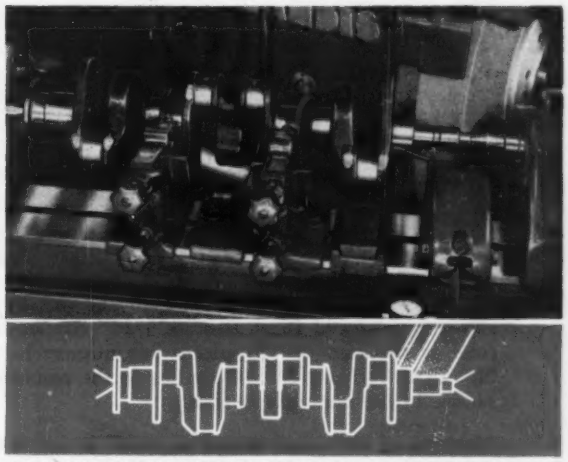
TWO DIAMETERS GROUND IN ONE OPERATION—by straight infeed with spaced wheels.



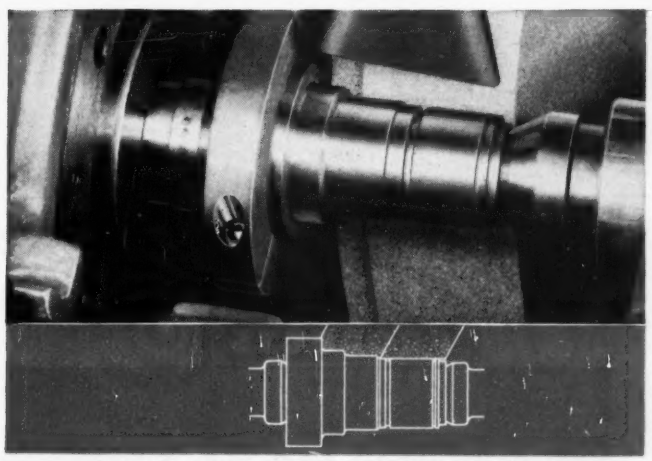
GRINDING DIAMETER AND ADJOINING RADIUS—in first operation. Second operation grinds adjoining diameter.



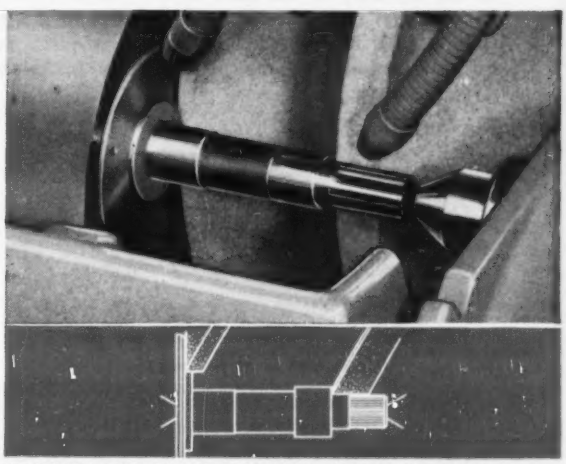
GRINDING TWO DIAMETERS IN ONE OPERATION—Straight infeed grinding with spaced wheels.



GRINDING END DIAMETERS AND FACE OF CRANKSHAFT—in one operation using spaced wheels on wheelbase set at 30° angle.

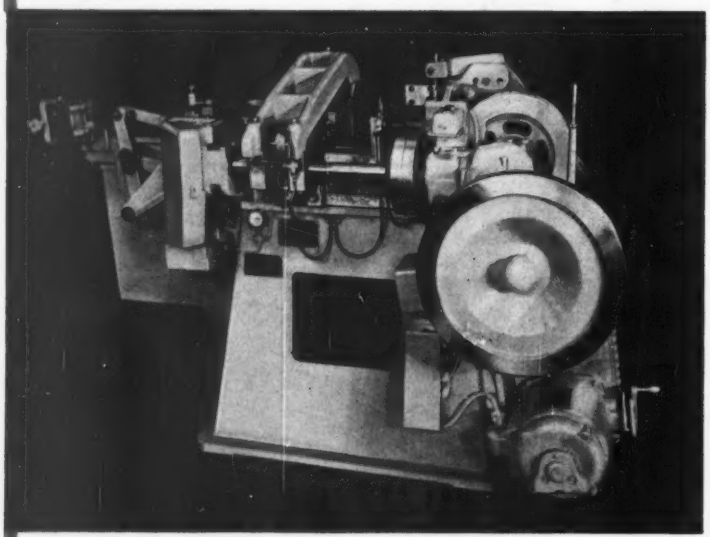


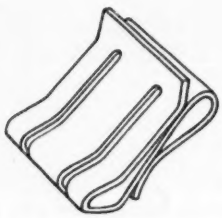
FACE AND THREE DIAMETERS GROUND IN ONE OPERATION—using a wide wheel, profile dressed and wheelbase set at 30°.

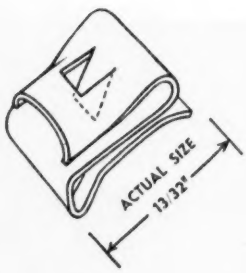


GRINDING TWO DIAMETERS WITH ADJOINING FACES—in one operation. Wheelbase set at 30°. Straight infeed grinding.

Produce Formed Stampings with U. S. MULTI-SLIDES®







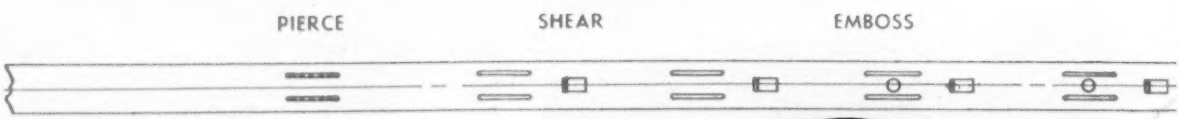
The small electrical part shown in the drawing above is produced from .018" x 5/16" copper in coils at the rate of 125 pieces per minute in a No. 28 U. S. Multi-Slide® similar to the machine shown in the photograph above.

Material of the exact width required is fed into the machine, thus eliminating trimming on the edges. No pilots are used in the dies, because of the accuracy of the feed unit. The feed pulls the material through a flat stock straightener and then pushes it into the dies the exact pitch required. A positive stop prevents any backward slippage of material.

The U. S. Multi-Slide produces parts of uniform accuracy, which naturally reduces spoilage and also results in saving time and labor where the parts are to be assembled in a larger unit. In the die head of the machine such operations as trimming, piercing, shearing, embossing or swaging may be performed; forming being handled by means of tools mounted on the forming slides.

• • •

Bulletin No. 15-M contains complete specifications for U. S. Multi-Slide Machines. May we send you a copy?



The sequence of operations for the part illustrated is as follows:

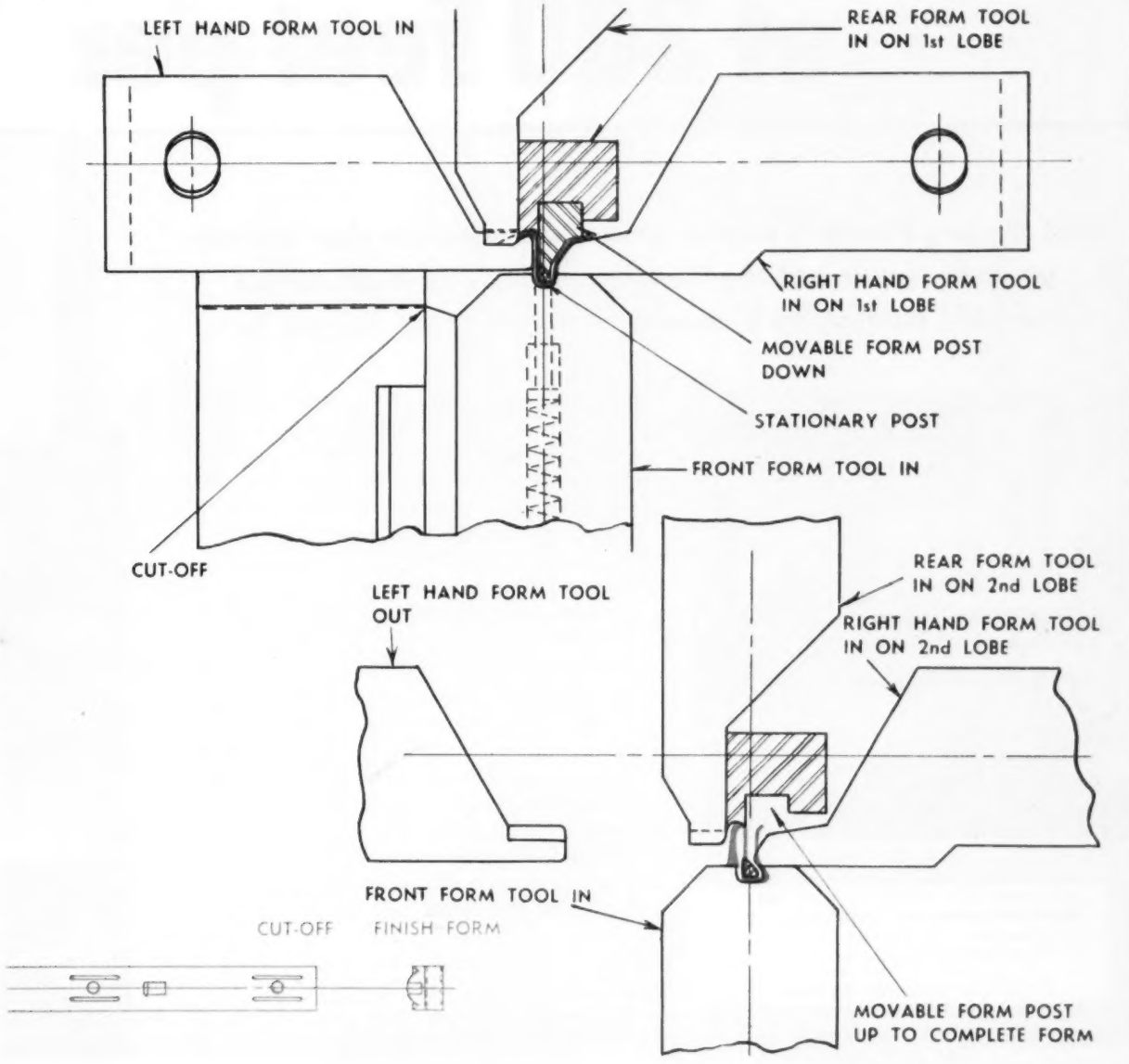
1. Pierce, shear and emboss in die head.
2. Cut off blank from strip, using cut-off slide.
3. Preform around movable and stationary form posts.
4. Finish form around stationary form post, with movable form post withdrawn.

Note that the left hand form tool is withdrawn, and secondary movements are obtained on the rear and right hand form tools by the use of two lobe cams.

U S PRODUCTS

U.S. TOOL

without Secondary Handlings


LEFT HAND FORM TOOL IN
REAR FORM TOOL IN ON 1st LOBE
RIGHT HAND FORM TOOL IN ON 1st LOBE
MOVABLE FORM POST DOWN
STATIONARY POST
FRONT FORM TOOL IN
CUT-OFF
LEFT HAND FORM TOOL OUT
REAR FORM TOOL IN ON 2nd LOBE
RIGHT HAND FORM TOOL IN ON 2nd LOBE
FRONT FORM TOOL IN
CUT-OFF
FINISH FORM
MOVABLE FORM POST UP TO COMPLETE FORM

®Trade Mark Registered—U. S. Patent Office

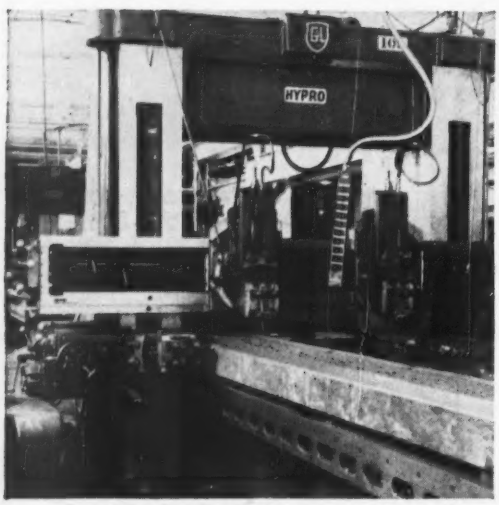
COMPANY, Inc. AMPERE (East Orange) NEW JERSEY

Builders of U S Multi-Slides—U S Multi-Millers

U S Automatic Press Room Equipment—U S Die Sets and Accessories

Planing semi-steel at 300 feet per

G&L Hypro Planer's power and rigid construction permit year in, year out, optimum accuracy in high speed carbide cutting to 1" depth at feeds from 3/64" to 1/8"



This photo shows the G&L Hypro Planer's fourth cutting head. On this operation, all cutting heads are used — production is increased, setup time is minimized.

SINCE 1947, Rice Barton Corp. of Worcester, Mass., has been using two G&L HYPRO Double Housing Planers to produce parts for paper mill and textile machinery. With them, semi-steel castings (30 to 40% steel), are being planed at speeds from 240 to 300 surface ft. per minute . . . with depth of cuts from ¼ to 1 inch . . . feeds from .045 to .125 inch. Mild steel parts are being planed at the same speeds, but at a maximum depth of ½ in. and a feed of approximately .030 inch.

Though shock on the carbide tools is very great due to irregular contours and interrupted surfaces, no tools have been broken in nearly a year of operation. This economical use of carbide tools is primarily possible because the G&L planers have the following features — sufficient power, (50/100 hp variable voltage drives) — double helical table drive which provides a straight flow of power with no side thrust — rigid construction of rail as well as rail head — and inverted dovetail slide construction.

If you'd like to know how G&L machine tools can help you speed your work by taking advantage of the latest cutting tool developments contact your nearest G&L representative and he'll be glad to give you the details on the G&L Job Analysis Service. If you don't know where to reach him, write direct.

GIDDINGS & LEWIS

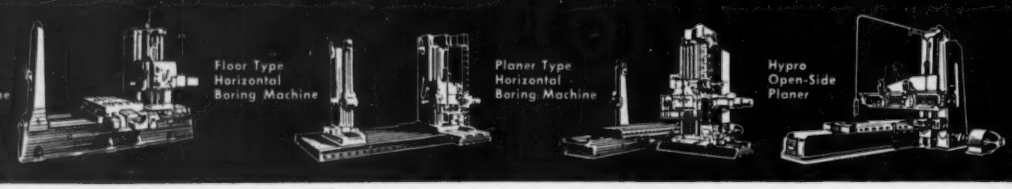
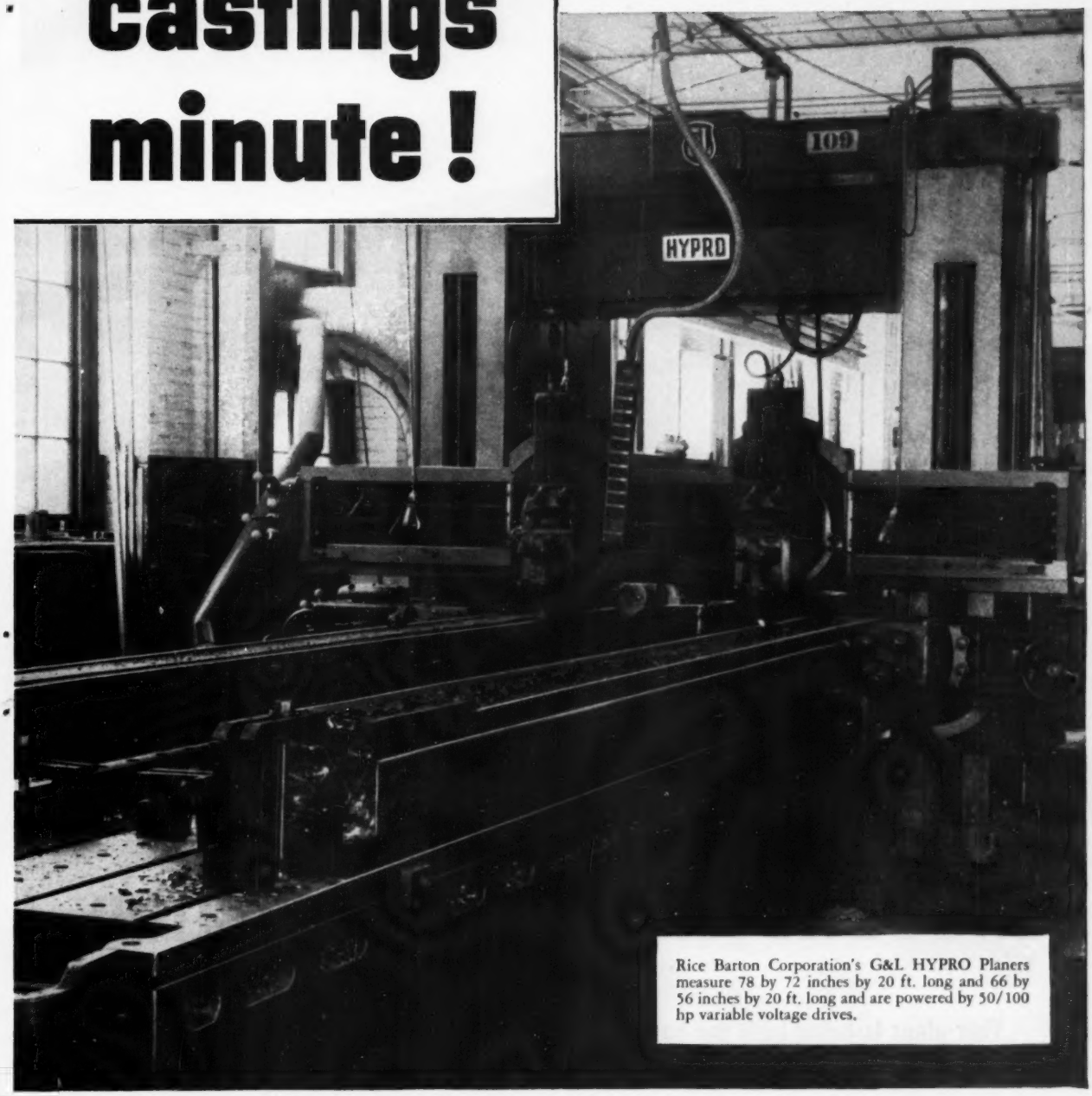


Table Type Horizontal Boring Machine
Floor Type Horizontal Boring Machine
Planer Type Horizontal Boring Machine
Hypro Open-Side Planer

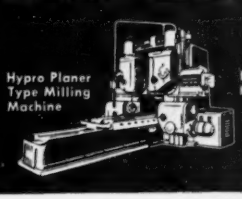
castings minute !

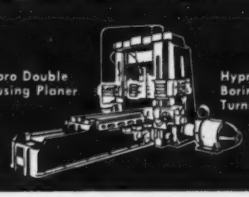


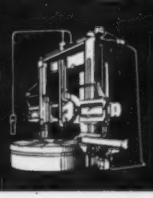
Rice Barton Corporation's G&L HYPRO Planers measure 78 by 72 inches by 20 ft. long and 66 by 56 inches by 20 ft. long and are powered by 50/100 hp variable voltage drives.

G-22

MACHINE TOOL CO.

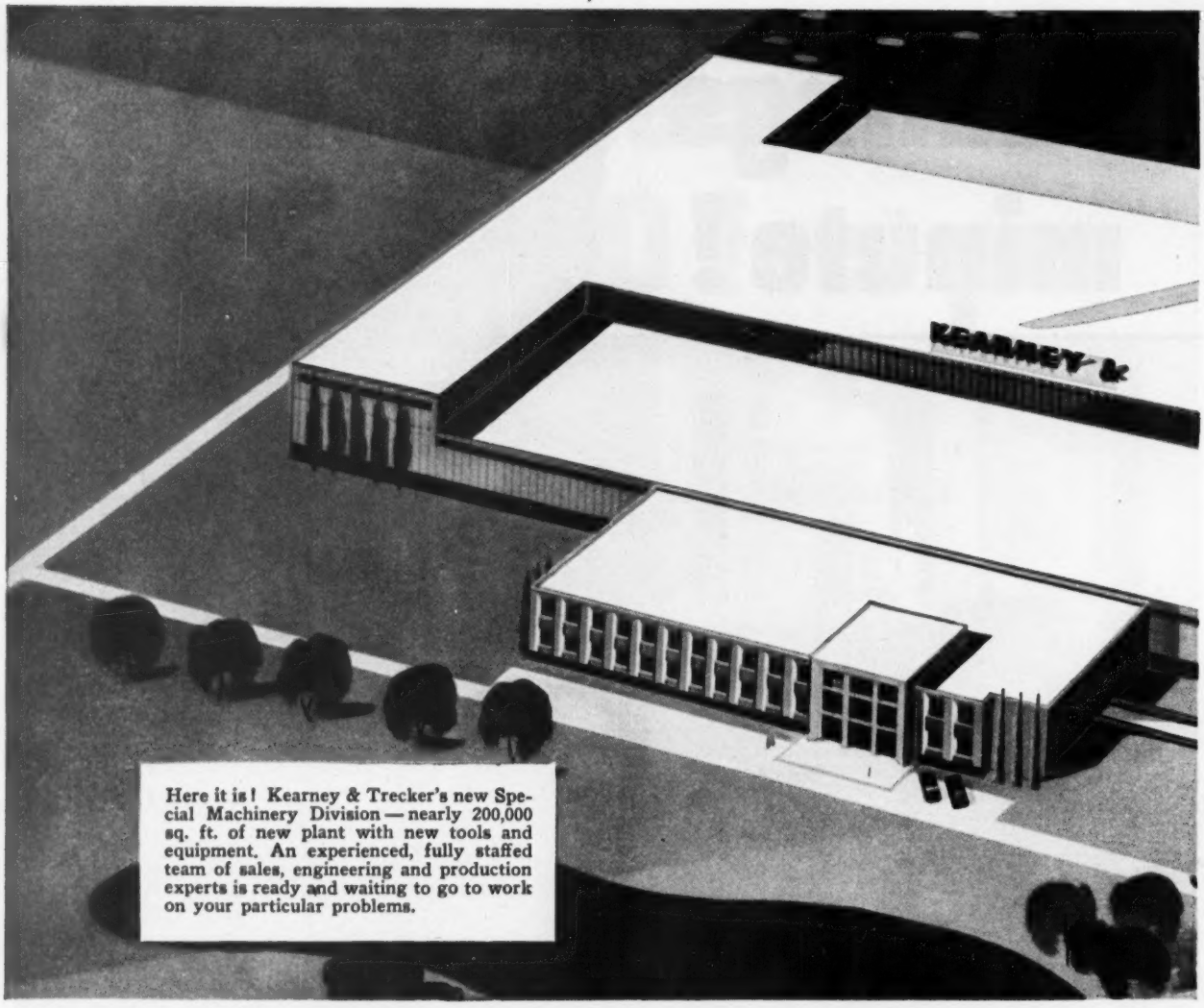

Hypro Planer Type Milling Machine


Hypro Double Housing Planer


Hypro Vertical Boring and Turning Mill

G&L HYPRO

FOND DU LAC
WISCONSIN



Here it is! Kearney & Trecker's new Special Machinery Division — nearly 200,000 sq. ft. of new plant with new tools and equipment. An experienced, fully staffed team of sales, engineering and production experts is ready and waiting to go to work on your particular problems.

INCUBATOR...for Production

This plant is being built for you . . . to engineer *new* production methods – to build the large or small special machines, tools and fixtures you need to improve production and cut costs.

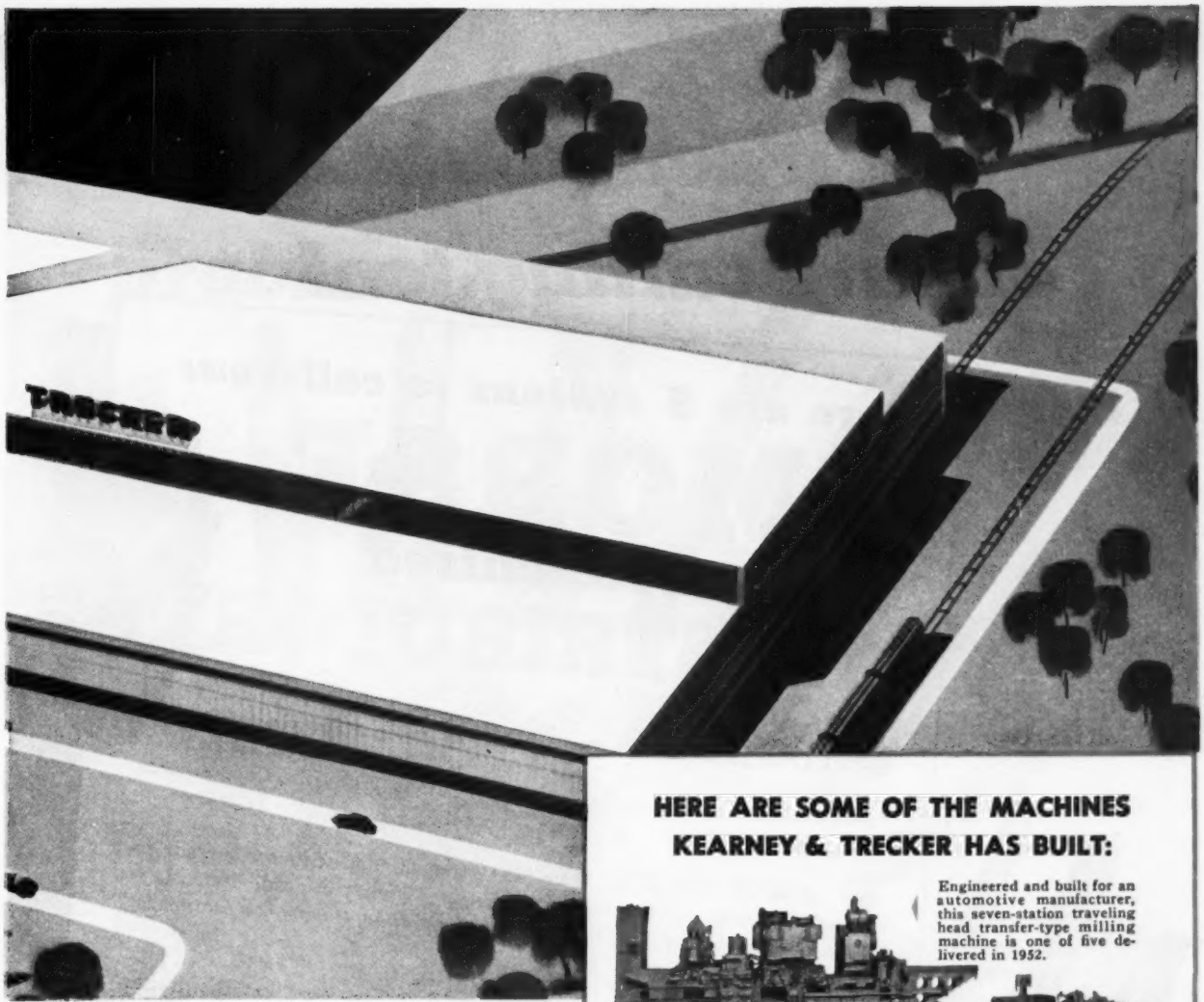
KEARNEY & TRECKER MILWAUKEE MACHINE TOOLS

Production behind schedule?
Costs going up, up and up?

Will special machines, special tools and fixtures or special arrangements of standard machines help you solve these problems?

Then why not be among the first to take advantage of the 5-million-dollar-plus investment that Kearney & Trecker is making in new plant, new tools and new engineering to help you solve them.

Kearney & Trecker *is no newcomer* to the field of special machine tools and allied special equipment. There are literally millions of dollars worth of Kearney & Trecker special machinery in plants all over the world. Equipment built over the period of more than 50 years of Kearney & Trecker's existence. And that doesn't include the 60,000



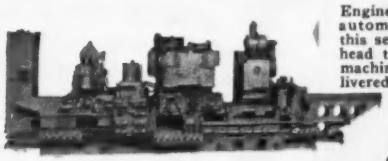
Ideas

Kearney & Trecker standard milling machines and other machine tools so well known and so widely accepted everywhere.

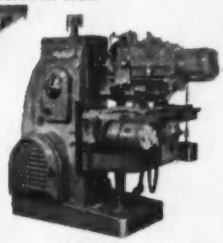
Kearney & Trecker is already working on new production ideas, new equipment and tool designs to be produced in this plant. Kearney & Trecker Special Engineering and Methods Analysts are ready right now to serve you with (1) Prompt response to your inquiry, (2) Immediate engineering help on your problem, plus, (3) The newest, finest and most complete facilities to build the special equipment you need — big or small.

Phone, write or wire The Special Machinery Division, Kearney & Trecker Corporation, Milwaukee 14, Wis., today. Get the facts about Kearney & Trecker's Special Machinery Division and how it can serve you.

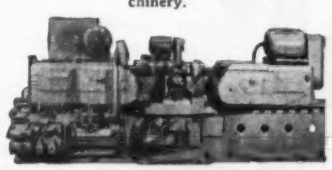
HERE ARE SOME OF THE MACHINES KEARNEY & TRECKER HAS BUILT:



Engineered and built for an automotive manufacturer, this seven-station traveling head transfer-type milling machine is one of five delivered in 1952.



Special knee-type cam milling machine — the first of twelve such machines to be built for the nation's largest manufacturer of shoe-making machinery.



This huge four-station rotary indexing machine, built for major automotive manufacturer, is equipped with three horizontal milling heads.

Here is a partial list of the machines that will be built:

- Standard and special bed type milling machines.
- Special index milling machines.
- Special transfer milling machines.
- Special index or transfer machines involving a combination of milling, boring, drilling or tapping to perform all operations on a workpiece.
- Special machines for the automotive, aircraft and farm implement industries.
- Special boring machines.
- Rise and fall milling applications.
- Modified standard and special knee-type milling machines.
- Special tooling for standard milling machines.

When you want on any cutting-tool

here are 5 reasons to call your MORSE-Franchised DISTRIBUTOR

1 COMPLETE LINE: Drills, Taps (including a new line of Special-Purpose Taps . . . and 7 new basic *and conversion* sets of Taps and Dies, handsomely boxed), Dies, Reamers, Cutters, End Mills, Counterbores and Countersinks.

2 AMPLE STOCKS: Your Morse-franchised Distributor is ready to supply you with the Morse Quality Cutting Tools you need. *New Morse methods of production, inventory control and expediting put him in a far stronger position in '53 than ever before.*

3 ON-THE-JOB EXPERIENCE: Your Morse-franchised Distributor knows his way around on cutting-tool applications, to give you *increased* production and *reduced* costs.

4 CLOSE CO-OPERATION FROM MORSE ENGINEERS: On any "cranky" or special problem, your Morse-franchised Distributor can immediately summon the help of Morse's top technical men.

5 PROVEN RESPONSIBILITY: Your Morse-franchised Distributor is a respected member of your business community. You can have full confidence, *as Morse has,* in him and his men.

THAT'S WHY IT'S ALWAYS GOOD BUSINESS TO "CALL YOUR MORSE-FRANCHISED DISTRIBUTOR"

MORSE TWIST DRILL & MACHINE COMPANY, NEW BEDFORD, MASS.
(Division of VAN NORMAN CO.)
Warehouses in New York, Chicago, Detroit, Houston, San Francisco

ACTION!

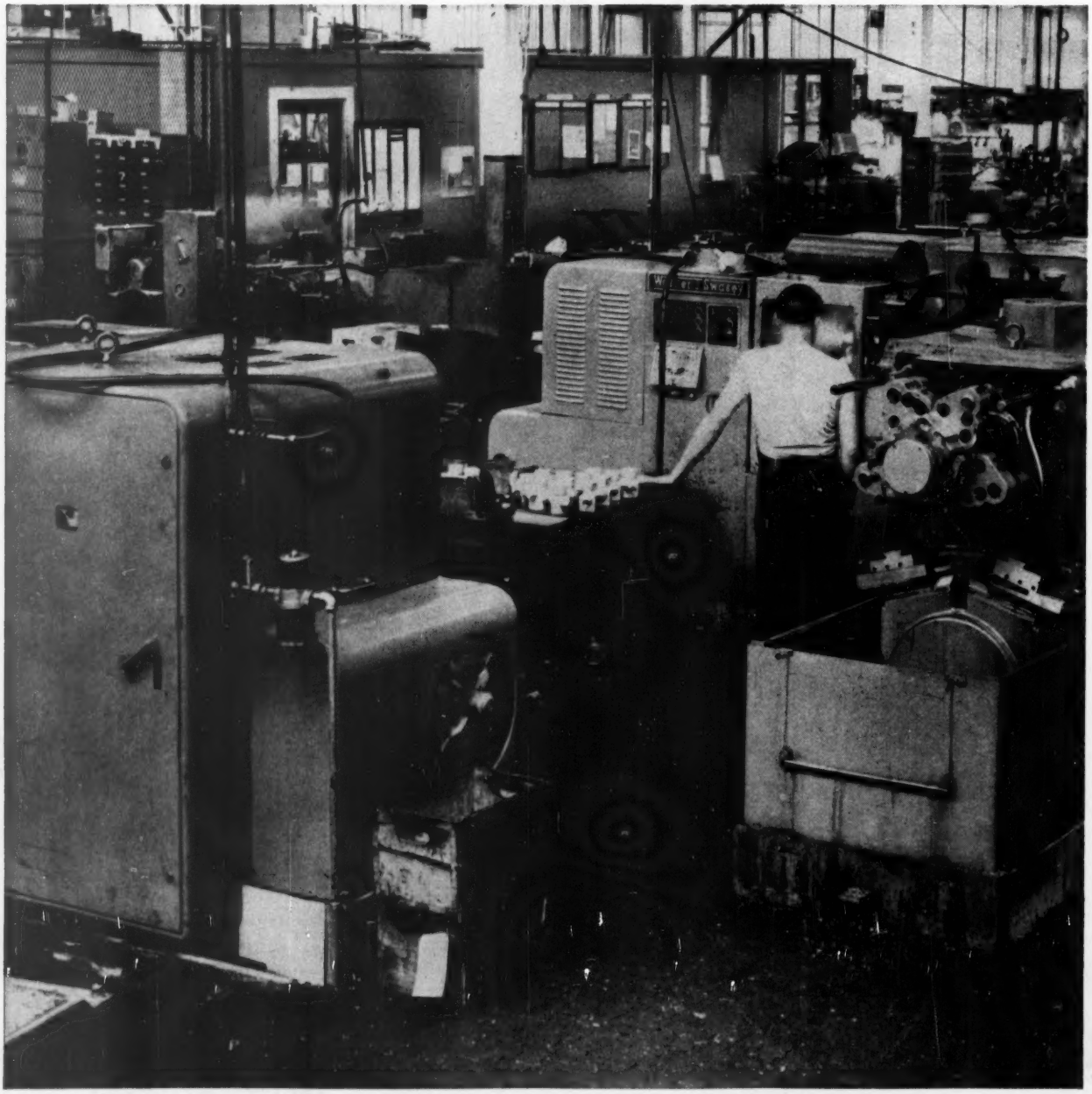
problem . . .

MORSE

Cutting Tools

Buy them by phone from your Morse-Franchised Distributor and save ordering time

How would you like to see

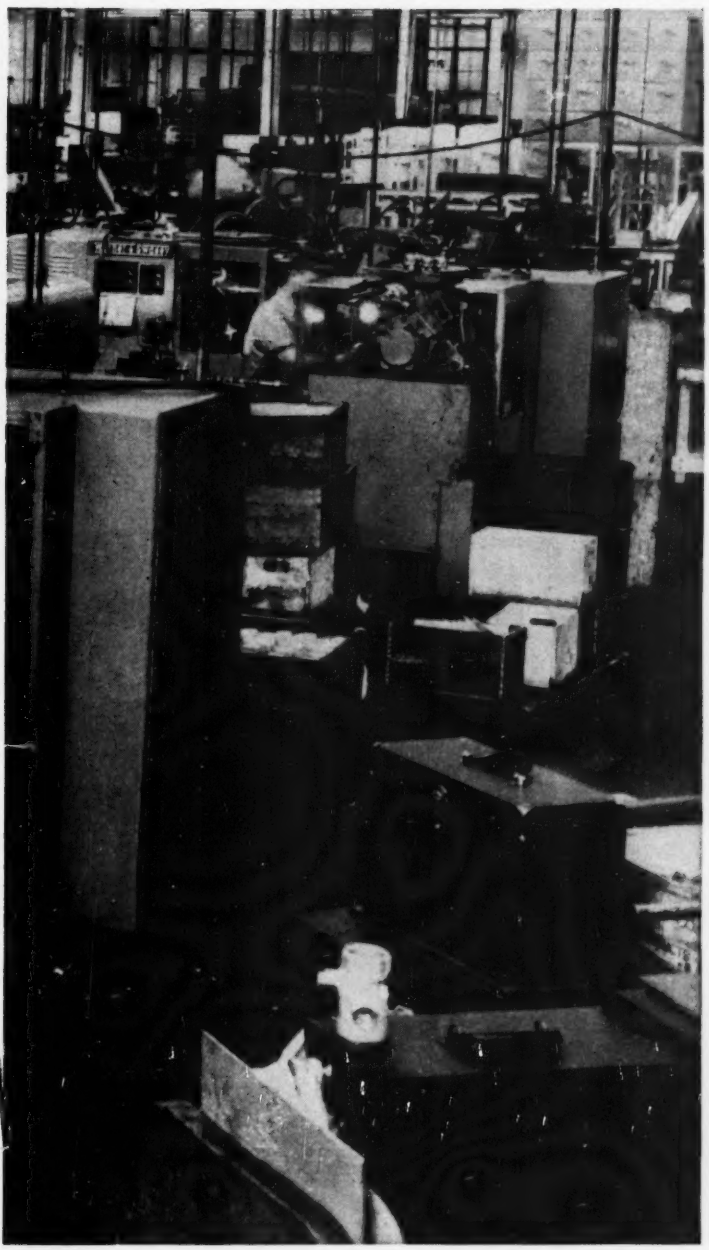


Warner & Swasey 1-AC Single Spindle Automatic Chucking Machines in use at Walter Kidde & Company, Inc., a leading manufacturer of fire extinguishing apparatus, textile machinery, aircraft and marine equipment.

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS WITH WARNER & SWASEY

your costs going down?

(FOR A CHANGE)



● With spiraling costs the headaches they are today, it's especially encouraging to see examples of costs going down. And that's exactly what happened at Walter Kidde & Company, Inc. of Belleville, N. J. This manufacturer put the skids under constantly rising costs by installing six new Warner & Swasey 1-AC Single Spindle Automatic Chucking Machines.

These new machines now handle chucking and turning operations on nine different parts—all formerly done with hand-operated machines—at less than ⅓ of the previous cost.

But that's not all! The 1-AC's helped solve a pressing manpower problem, because one operator can now handle two or more machines.

Result? The Kidde Company has added nine more of these cost-cutting machines —giving them a total of fifteen 1-AC's!

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

MACHINE TOOLS, TEXTILE MACHINERY, CONSTRUCTION MACHINERY

When Size Control Counts, the
BALANCED Action
of Winter Taps pays off in precise accuracy, as well as long tool life.
ALWAYS AT YOUR SERVICE
Your local Industrial Supply Distributor carries a complete stock of WINTER Taps.
WINTER
WINTER BROTHERS COMPANY
Rochester, Michigan, U.S.A. Distributors in principal cities.
Branches in New York, Detroit, Chicago, Dallas, San Francisco.
Division of National Twist Drill & Tool Co.
WINTER
WINTER
WINTER
WINTER

At High Feeds and Speeds

—"Helex" End Mills, with their National cutting edges and high helix angles, give you smooth free-cutting operation. *Long tool life, too!*

NATIONAL TWIST DRILL AND TOOL COMPANY

Rochester, Michigan, U. S. A. Distributors in principal cities. Factory Branches: New York • Detroit • Chicago • Dallas • San Francisco.

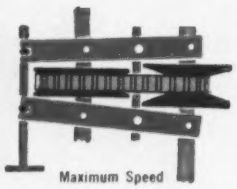
CALL YOUR INDUSTRIAL SUPPLY DISTRIBUTOR

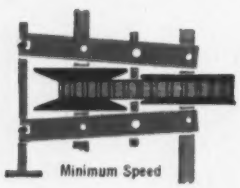
. . . for all your staple industrial needs, including NATIONAL Twist Drills, Reamers, Counterbores, Milling Cutters, End Mills, Hobs, and Special Tools.

NATIONAL TWIST DRILL & TOOL ROCHESTER, MICH., U.S.A.

National

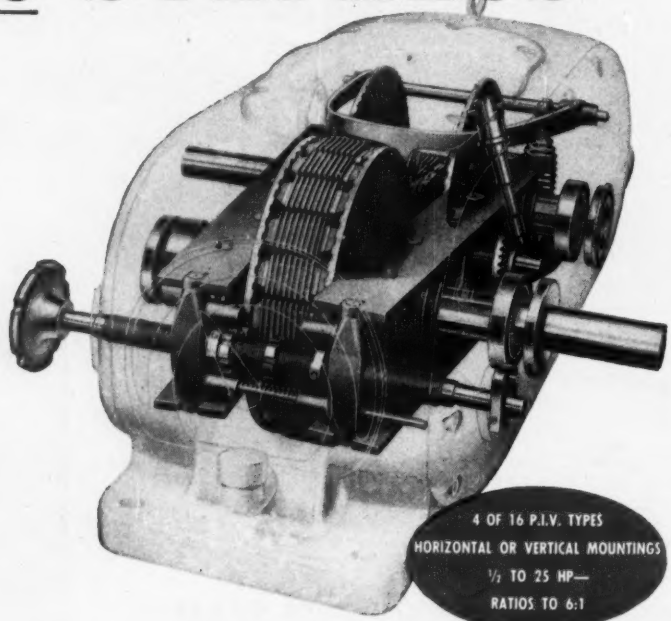
Always POSITIVE...
Always STEPLESS





Note how the effective diameter of P.I.V.'s wheels can be altered to change their ratio. You can select any point—from maximum to minimum setting—and get positive, accurately maintained speed.

ALL INDUSTRY USES P.I.V.*
*Positive, Infinitely Variable



4 OF 16 P.I.V. TYPES
HORIZONTAL OR VERTICAL MOUNTINGS
½ TO 25 HP—
RATIOS TO 6:1

P.I.V. Variable Speed Drive gives you infinite speed choices

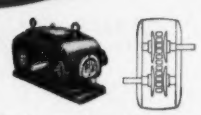
SELECT ANY SPEED within normal operating range, and you can always be sure Link-Belt's P.I.V. Variable Speed Drive will maintain it accurately under full load conditions.

P.I.V. is not dependent on friction for power transmission. Self-tooth-forming chain meshes with grooved wheels to provide positive, infinitely variable speed selection. Using P.I.V., your machines are capable of working to maximum capacity according to the job. Control can be manual or automatic while running under full load.

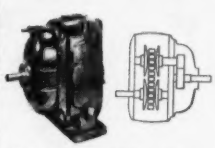
Link-Belt's P.I.V. Variable Speed Drive is compact. It is particularly adapted to delicate or sensitive manufacturing processes that require exacting variable speed transmission. Find out how you can increase the flexibility and efficiency of your machines. Call your nearest Link-Belt office today for complete, detailed information. Send for Catalog No. 2274.

LINK-BELT
P.I.V. VARIABLE SPEED DRIVE

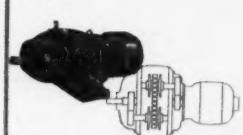
LINK-BELT COMPANY: Plants: Chicago, Indianapolis, Philadelphia, Colmar, Pa., Atlanta, Houston, Minneapolis, San Francisco, Los Angeles, Seattle, Toronto, Springs (South Africa), Sydney (Australia). Sales Offices, Factory Branch Stores and Distributors in Principal Cities. 13.115



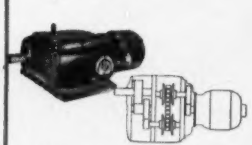
Basic, Positive, Infinitely Variable (P.I.V.) Speed Drive.



P.I.V. with single reduction input or output helical gears.



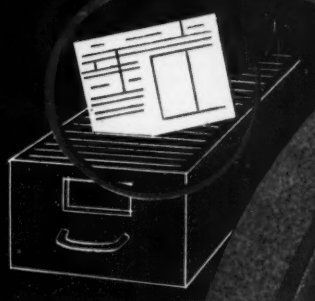
Motorized P.I.V. with single reduction input and output helical gears.



Motorized P.I.V. with single reduction input and double reduction output helical gears.

Customized Abrasive Discs Fitted To Your Grinding Needs

GARDNER abrasive discs



Gardner Abrasive Engineers—located in all principal cities—will be glad to help you with all your flat surface grinding problems.

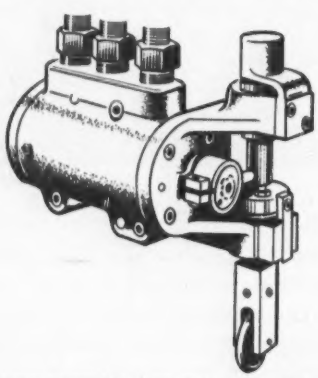
Send for Gardner Abrasive Disc Guidebook for better surface grinding results.

Gardner varies abrasive type, grain size and structure until you get the *best* abrasive to meet your job requirements. You get a Gardner Customized Abrasive that meets your needs for production, stock removal, finish, tolerance. Once your specific formulation is determined, the card record goes into our permanent file. Grinding results on reorders will be duplicated because your specific abrasive formulation has been duplicated. 109 A

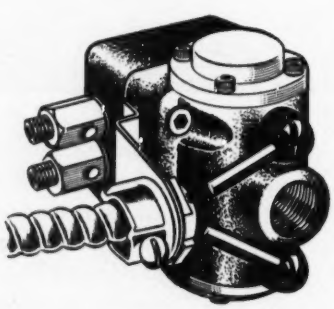
GARDNER MACHINE COMPANY

414 Gardner Street • Beloit, Wisconsin, U. S. A.

UNBRAKO SOCKET CAP SCREWS have knurled heads for sure grip and fast assembly; accurate hex sockets for positive, nonslip internal wrenching; fully formed threads, Class 3 fit. They are made of heat treated alloy steel, with controlled fillet and continuous grain flow, for strength; and are available in standard sizes from #4 to 1" in a full range of lengths.



USE UNBRAKO SOCKET CAP SCREWS for compact designs to save space, weight and material on machine tools and metalworking equipment.



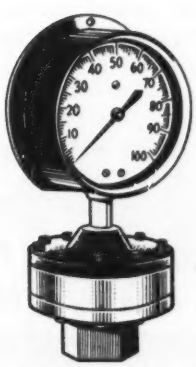
On textile machines, automotive equipment, electrical and electronic devices, and production machinery.

Do you really need a special UNBRAKO?

Before you specify a special socket screw, check UNBRAKO Standards. A standard UNBRAKO will do the same job much cheaper in most cases. You'll get better service and faster deliveries, because UNBRAKO socket screw products are stocked by your industrial distributor. Write for UNBRAKO Standards. SPS, Jenkintown 19, Pa.

UNBRAKO® SOCKET SCREW DIVISION

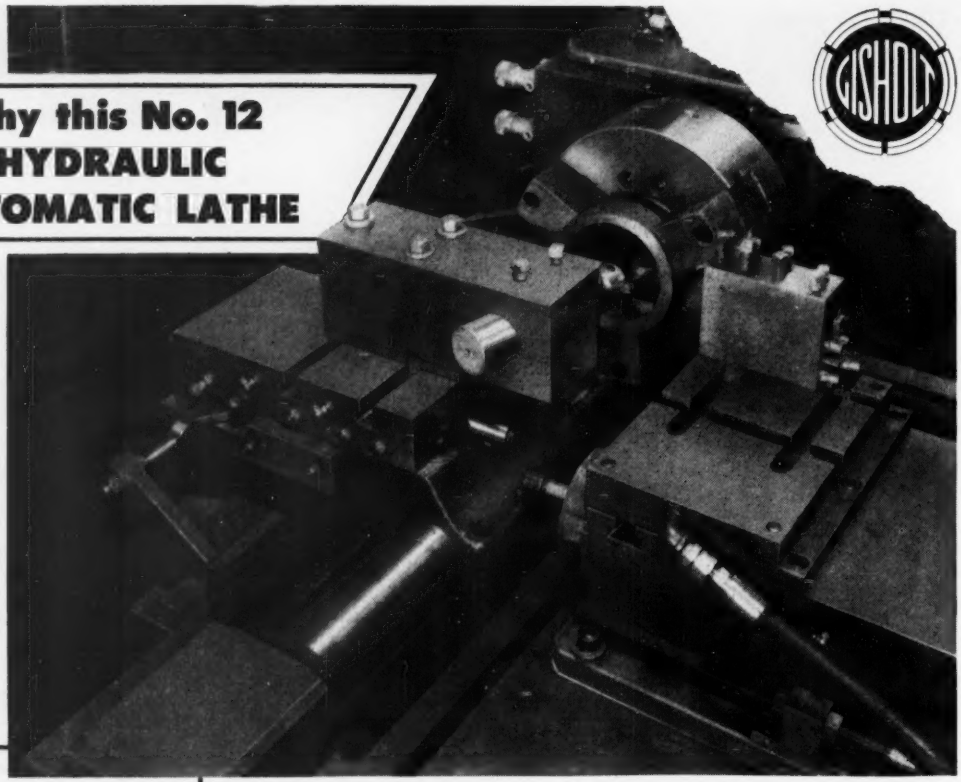
SPS
JENKINTOWN PENNSYLVANIA

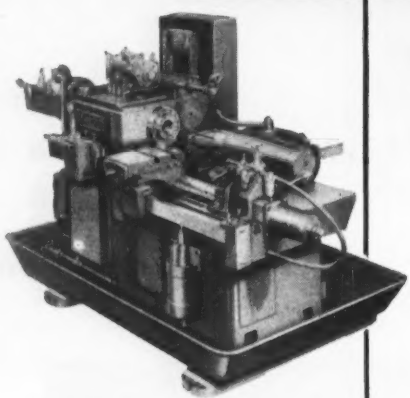


On precision instruments, dies, jigs and fixtures, and many other applications too numerous to mention.

UNBRAKO Standards—as listed in the SPS Catalog—are stocked by leading industrial distributors everywhere.

why this No. 12 HYDRAULIC AUTOMATIC LATHE





The Gisholt Hydraulic Automatic Lathe is a genuinely rugged 12" lathe, suited for light, fast jobs. Handles chucking, between centers, or fixture-held work.

maintains GREATER ACCURACY

Here, feed pressures are applied directly to tools without intermediate cams, arms or other linkage. Accuracy is further insured by feeding against dead stops. In all cuts there is a moment of dwell during which cuts are cleaned up.

Front carriage is mounted on and driven by the massive bar to which it is clamped. Wide lateral support of carriage assures rigid alignment without tremble or tremor.

Movement of the massive rear slide is by hydraulic piston in the base of the slide itself.

Both carriages are directly supported by the massive integrally cast cabinet type bed, and all bearing surfaces, ways and gibs are hardened and ground steel to assure permanent accuracy.

THE GISHOLT ROUND TABLE

represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

TURRET LATHES · AUTOMATIC LATHES · SUPERFINISHERS · BALANCERS · SPECIAL MACHINES

For CIMCOOL covers 85% of all metal cutting jobs!

● CIMCOOL° leads the league because it's a radically new and different cutting fluid that replaces all water emulsions and all but a few highly compounded specialty oils.

● Cimcool scores over old-fashioned coolants because it's a *chemical emulsion*. It permits faster speeds and increases tool life because Cimcool combines friction reduction and cooling capacity in a degree never before attained. It's longer lasting in machines, too. So Cimcool reduces downtime and cuts labor costs for cleaning and changing.

● For a demonstration of how CIMCOOL can improve your production batting-average, just write us. We'll have one of our Cincinnati Milling-trained machinists call on you—without cost or obligation. Or, if you prefer, write for our free booklet, "Cimcool Defeats Heat." Address Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

°Trade Mark Reg. U.S. Pat. Off.

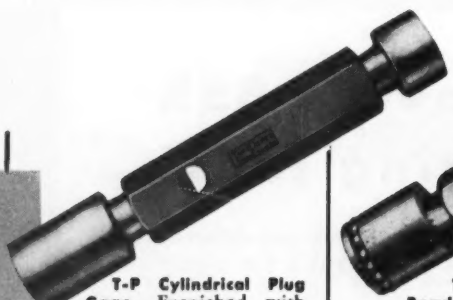
A Production-Proved Product of
THE CINCINNATI MILLING MACHINE CO.

TIPS FROM TAFT-PEIRCE ON:

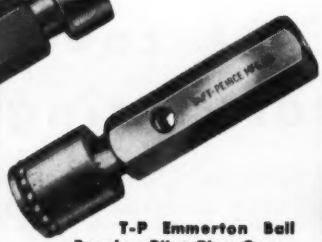
Selecting a FIXED GAGE

The *best* gage for most jobs provides the *best* combination of speed, wear-resistance, upkeep, and initial cost. When it comes to Fixed Gages, here are some comparisons that will help you make your selection.

Plain Plugs



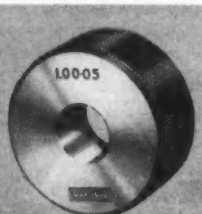
T-P Cylindrical Plug Gage. Furnished with "Go" and "Not Go" separately, or on opposite ends of handle. Progressive gage — with "Go" and "Not Go" on same end increases speed.



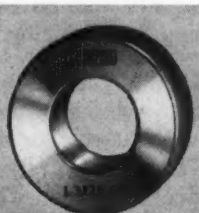
T-P Emmerton Ball Bearing Pilot Plug Gage. Guides gage into alignment. Won't jam. Eliminates end-wear, or burring — valuable on soft metals. Gages faster, lasts longer.

T-P Carbide, Norbide, and Chromium Plated Plugs. For exceptional resistance to abrasion or scratching. Maximum wear-life. Brittleness requires care in handling.

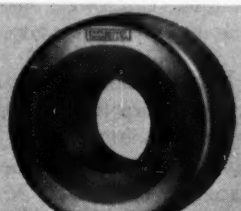
Plain Rings



T-P External Ring Gage. For reference purposes, setting air or other variable gages and accurate size control of parts.



T-P Chromium-Plated Ring. Lowers gaging costs on longer runs of highly abrasive materials or hardened steel. Provides up to 5 times more service.



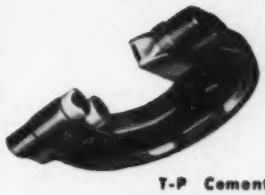
T-P Norbide and Carbide Rings. For greatest wear-resistance. Available in Norbide and Tantalum or Tungsten Carbide. Brittleness requires careful handling.

THE TAFT-PEIRCE
WOONSOCKET,

Adjustable Snaps

T-P Plain Adjustable Snap Gages. Available with gaging pins, round or square buttons, and solid anvils in combination with buttons.

T-P Midget Snap Gages. Smaller in size and section, their light weight aids in gaging small or delicate parts. Maximum rigidity and stability are provided.



T-P Cemented Carbide or Norbide Snaps. For close tolerance work on abrasive materials. Gaging members tipped with Tungsten or Tantalum Carbide. Or with Norbide inserts, as shown.

Thread Plugs

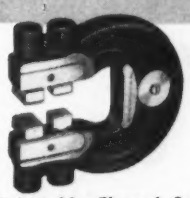
T-P Limit Thread Plug Gage. Available in Taper Lock or Trilock design. Taper Lock up to 1.510". Reversible from No. 0 to ½". Reversible Trilock above 1.510".

T-P Carbide Thread Plug Gage. For longer wear. Furnished both standard and special from #8 machine screw size up.

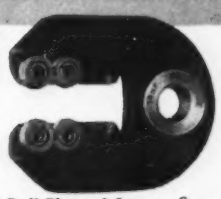
T-P Truncated Thread Set Plug Gage. Sets and checks thread gages with greater accuracy. Checks thread angle and O. D. Indicates wear, or oversize.

Thread Rings & Snaps

T-P Thread Ring Gages. Single unit clamping device simplifies setting, increases accuracy, eliminates distortion. Locks without changing pressure on ring.

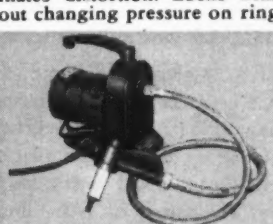


T-P Adjustable Thread Snaps. Faster than ring gaging, and just as accurate, they check lead, angle, and all other thread elements. Variable pitch diameter.

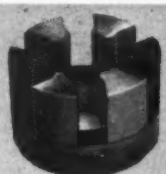


T-P Roll Thread Snaps. Same as Adjustable, with *rolls* for gaging members. Since gaging members rotate, wear is spread over greater surface and service life increased.

Special Gages



T-P Rotocheck. Fastest thread gaging method. Push — and the gage screws into the work. Release the pressure and it stops. Pull—and it disengages.



T-P Spline Gages. A special gage due to the diversity of individual requirements. Thousands of such special gages are made at Taft-Peirce every year.

T-P Thread Concentricity Gage. Checks size and location of internal threads. Another example of infinite variety of fixed gages made by T-P.

Gage Blocks

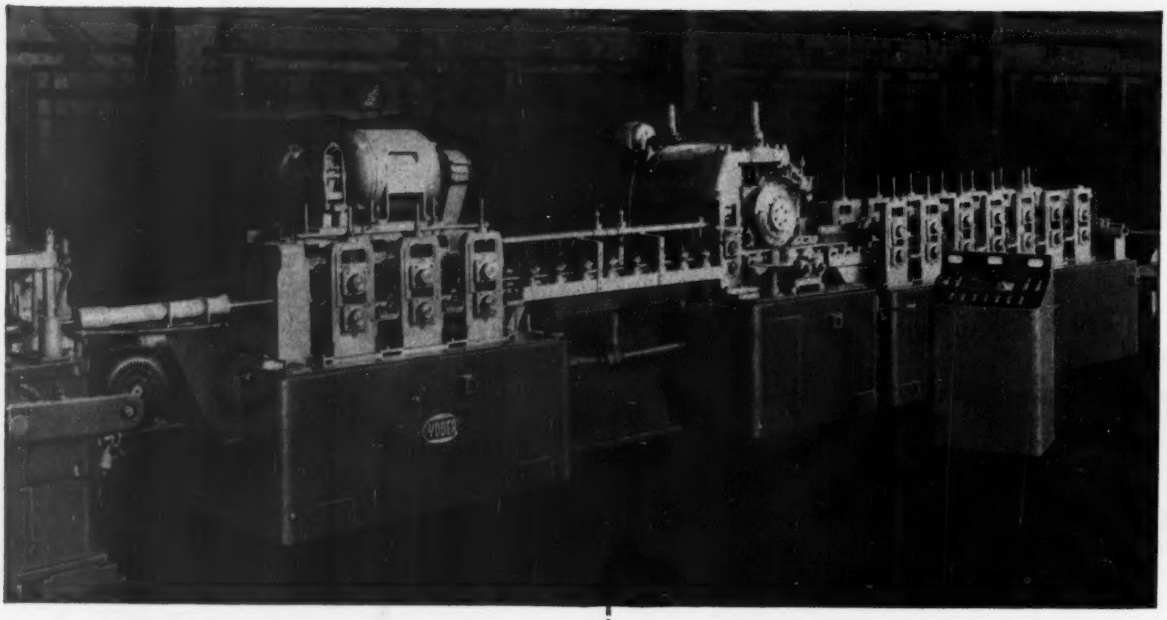
T-P Gage Blocks. For the ultimate in accuracy. Measures increments down to 0.00005". Available in small or large sets, or individually. Carbide Wear Blocks also available.

MANUFACTURING COMPANY
RHODE ISLAND

T-P means Top Precision

T P

For the complete story on these items, and many more, get your copy of the new Taft-Peirce Handbook.



Highest Output of

Quality Tubes

• Most manufacturers, when investing in an electric-weld tube mill, do so only after careful investigation, especially of performance records. Where, as often happens, records are available of the output and scrap losses of different mills, making comparisons possible, the choice of a Yoder is never in doubt. As a result, since their introduction in 1938, more Yoder mills have been installed in the U.S.A. and many foreign countries than electric-weld mills of all other makes combined.

In fact, the high quality and economy of tubing made in Yoder mills, have powerfully stimulated consumption and multiplied the uses for electric-weld tubing in the automotive, electric appliance, metal furniture and other mass production industries. The supply of such tubing, therefore, has never caught up with the demand.

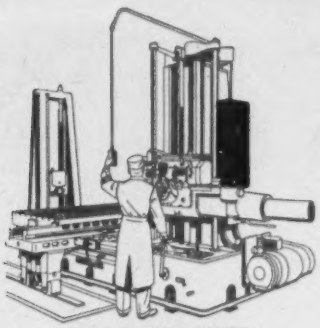
Get the facts about Yoder mills, incorporating the latest developments in tube making, including the revolutionary new Yoder high speed induction welders for *non-ferrous as well as ferrous metals* and alloys.

THE YODER COMPANY
5504 Walworth Ave. • Cleveland 2, Ohio

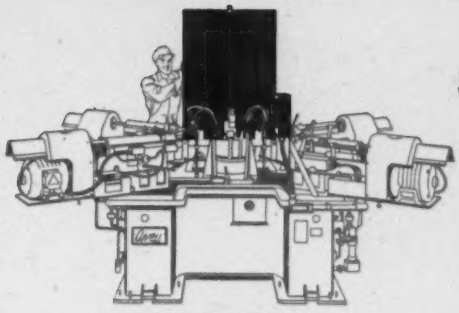
Complete Production Lines

- ★ COLD-ROLL-FORMING and auxiliary machinery
- ★ GANG SLITTING LINES for Coils and Sheets
- ★ PIPE and TUBE MILLS–cold forming and welding

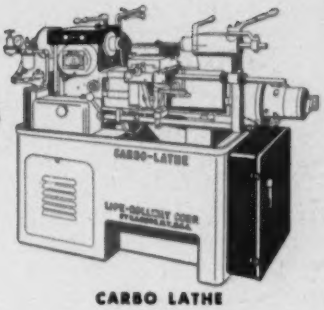
ENGINEERING YODER MANUFACTURING



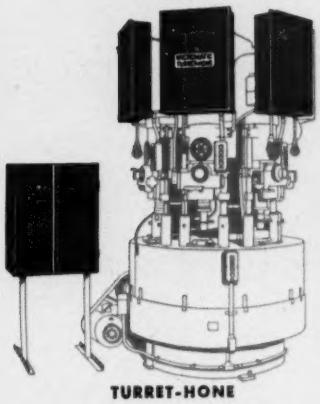
HORIZONTAL BORER



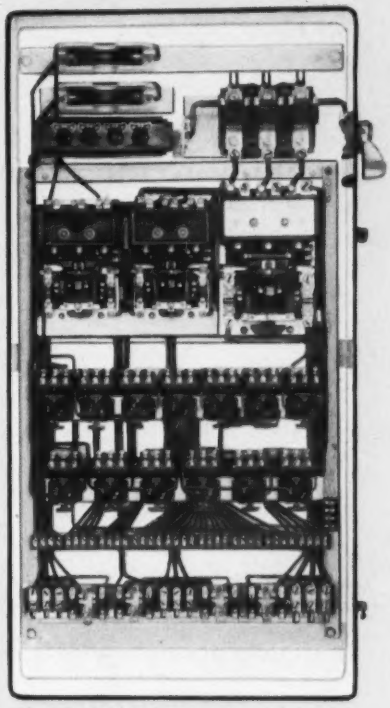
DRILLING MACHINE



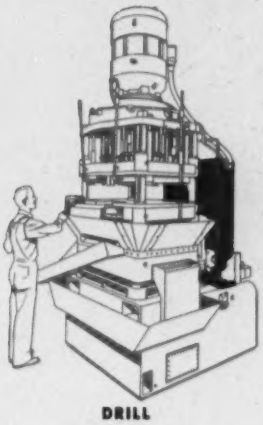
CARBO LATHE



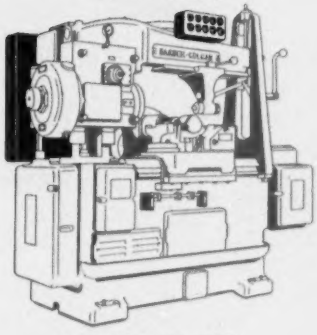
TURRET-HONE



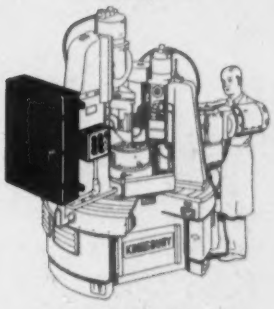
Typical machine tool control panel showing disconnect unit, contactors, and accessories



DRILL



HOBBING MACHINE



TAPPING MACHINE

MACHINE TOOL CONTROL PANELS

● ● ● ENGINEERED TO SATISFY YOUR NEEDS

Allen-Bradley control panels are popular with machine tool builders, because—

1—A-B contactors and relays have acquired a world-wide reputation for dependability and precision control. Consistently, they perform millions of trouble free switching operations.

2—A-B engineers, through long experience, are skilled in developing sequence control panels. Due to the compact design of A-B components, smaller panels are a common result . . . which means less space is used on the machines.

3—The A-B trademark is a sales asset for your motorized machine tools. It is the mark of Quality in motor control . . . known and accepted by machinery buyers, everywhere.

It will pay you to discuss your control problems with Allen-Bradley. A field force of Allen-Bradley engineers, located in all principal cities, is at your service. We shall be glad to send you the A-B Handy Catalog.

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.

4-53-R

A-B Quality

ALLEN-BRADLEY QUALITY

SPECIAL PANELS

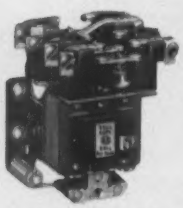
A-C & D-C TROUBLE FREE RELAYS

from 1 to 12 POLES

THE UTMOST IN RELAY DEPENDABILITY

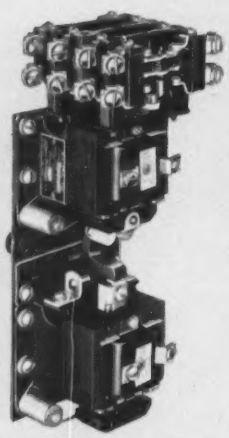
HUM-FREE A-C RELAYS

Relays in hospitals, churches, etc., must be hum-free. For these places, Types BM and BXL relays are recommended. Continuous coil currents are not needed to hold them closed. Also useful for machine tools.



TYPE BM—Residual Magnetic Latch

Contacts are held closed by residual magnetism of core. A demagnetizing coil current opens relay.



TYPE BXL—Mechanical Latch 2-Unit Relay

Lower solenoid trips the mechanical latch of the upper relay to open the upper relay contacts.

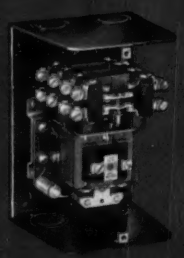
Bulletin 700 Relays are built to the same critical operating standards as the larger switching units in the Allen-Bradley line.

They have only one moving part . . . the simple solenoid plunger that opens and closes the double break, silver alloy contacts. Available in many varieties of contact arrangements . . . up to 12 poles . . . with or without enclosures. Long, trouble free life makes these relays the ideal pilot controls for installations which are likely to get infrequent inspection and maintenance.

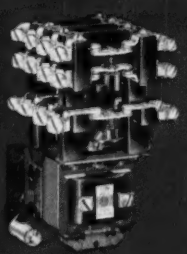
Send for Bulletin 700 containing complete details on ratings, dimensions, and related accessories.

Allen-Bradley Co.
1316 S. Second St., Milwaukee 4, Wis.

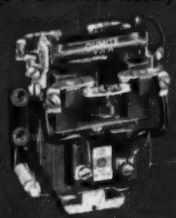
TYPICAL RELAYS in the ALLEN-BRADLEY LINE



Relay in Enclosure



8 Pole A-C Relay



3-Wire Thermostat Relay

Low Current A-C Relay

D-C Relay

Bulletin 709 Size 3 Solenoid Contactor

ALLEN-BRADLEY

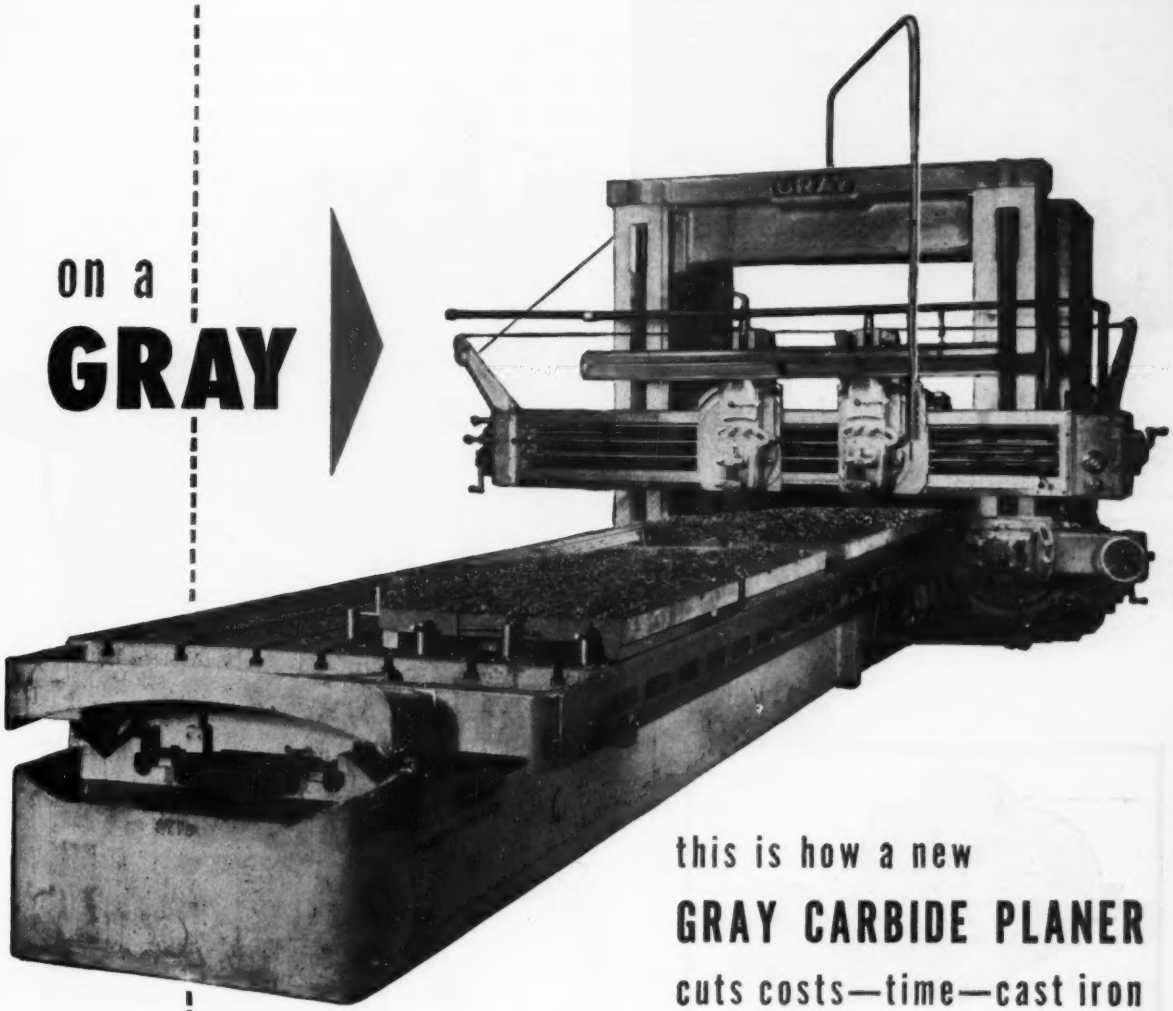
RELAYS & CONTACTORS

A-B Quality

4-53-E

BIG CARBIDE PLANING PROFITS

on a **GRAY**



The F. X. Hooper Co., of Glen Arm, Md. is successfully and profitably carbide planing cast iron frames on this new 84" x 60" x 18' high speed GRAY PLANER.

this is how a new

GRAY CARBIDE PLANER

cuts costs—time—cast iron

- using modern carbide tools at speeds up to 300' per min. — feeds up to ⅛" and depths of cut to 1¼".
- Check your planer department's time and cost figures. New GRAY performance will make your old planer *really old*.

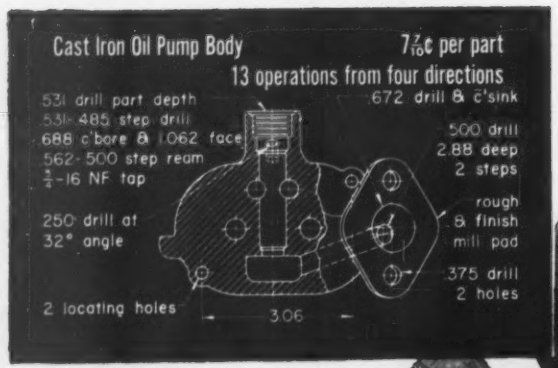
The G.A. **GRAY** *Company*

planers • milling planers
planer type milling machines
horizontal boring machines

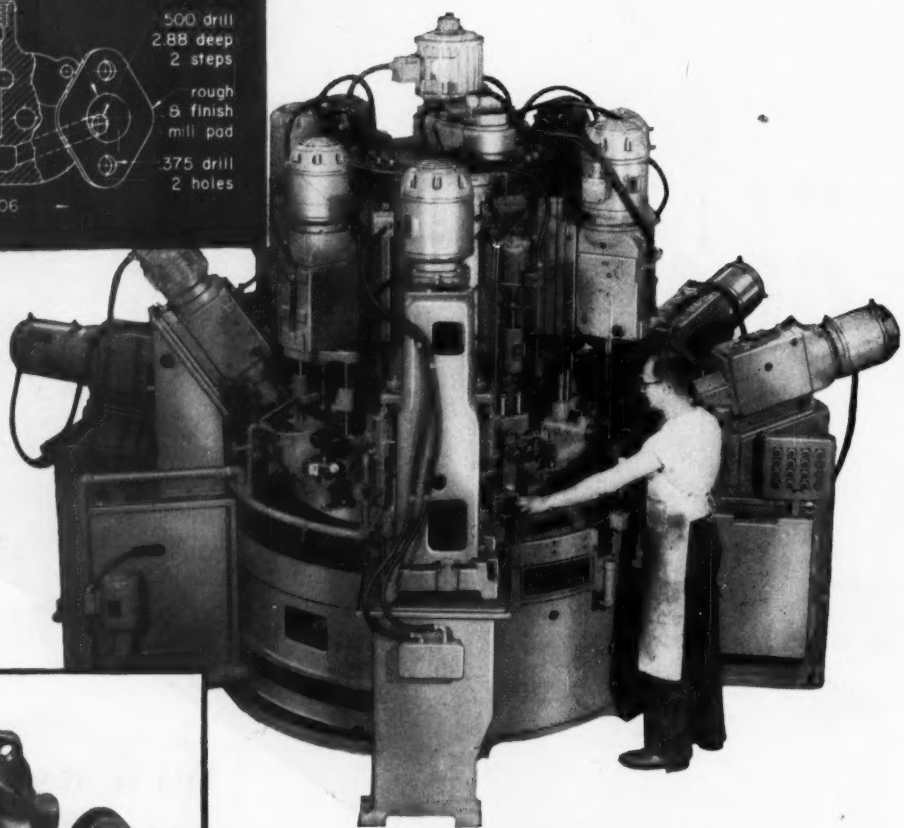
CINCINNATI 7, OHIO, U. S. A.

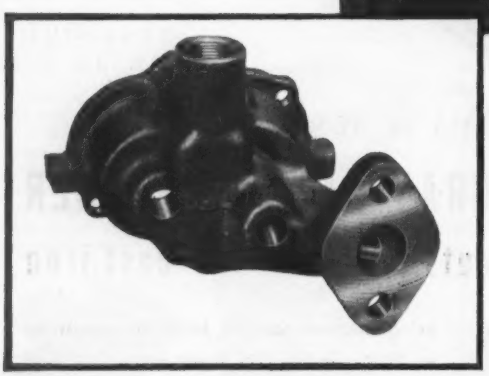
SOLD IN CANADA BY UPTON, BRADEEN AND JAMES, LTD. • SOLD IN LATIN AMERICA BY MACHINE AFFILIATES

More parts per man-hour soon


Cast Iron Oil Pump Body
7 7/10¢ per part
13 operations from four directions
.531 drill part depth
.531-.485 step drill
.688 c'bore & 1.062 face
.562-.500 step ream
3/4-16 NF tap
.250 drill at 32° angle
2 locating holes
3.06
.672 drill & c'sink
.500 drill 2.88 deep 2 steps
rough & finish mill pad
.375 drill 2 holes

13 Operations from 4 Directions 7 7/10¢ per part





Production is 200 parts per hour gross.

KINGSBURY Special Purpose Drilling and Tapping Machine Combines Operations to Save Money

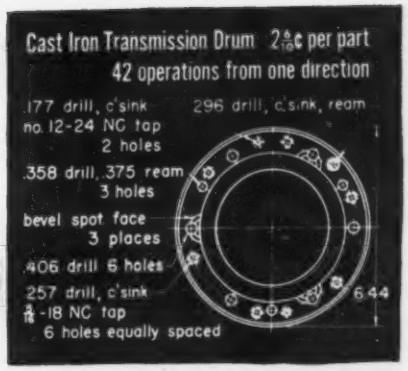
Dear Sir:

Look at this Cast Iron Oil Pump Body. How many machines would *you* need to do all this work? One central column Kingsbury with an 84-inch base and 60-inch index table does all 13 operations. It has ten stations with 11 drilling units and one tapping unit. One unit has a two-spindle auxiliary head. Six units are mounted vertically. The other six units are mounted on knees bolted to the base and these are mounted at three different angles to the work.

The longest single operation governs the time required to finish one piece. By splitting a long operation into two short ones, using two units, the time cycle can be cut. Thus the .500 hole is drilled in two steps.

Bushing carriers guide all tools except the tap, the milling cutters and the second .500 drill. This means accurate alignment and precise positioning from the locating point. An interesting operation is the finish milling operation which has a special mechanism that draws the cutter away from the work on the up stroke. No tool marks to mar the finish.

pay for a KINGSBURY



Designed to Produce One Part

Kingsbury Machines are designed for low production costs on long runs of parts requiring several operations. The more operations at one setup, the greater are the savings possible. But these machines pay for themselves on simple work too. For example, the Steel Bearing Race shown at the lower left requires only a few operations. The Kingsbury machine soon paid for itself with more parts per man-hour at greater accuracy.

Each machine is equipped with ½ to 5 hp automatic units. The number of units and the type of work holders depend on the work to be done. The work table may be stationary or it may be indexed. Your Kingsbury will come to you ready to run.

How Unit Costs were Figured

Each unit cost shown is the sum of these two figures —

The unit cost of the man:

$$\frac{\text{average U. S. hourly rate}}{\text{hourly gross} \times 80\% \text{ efficiency}}$$

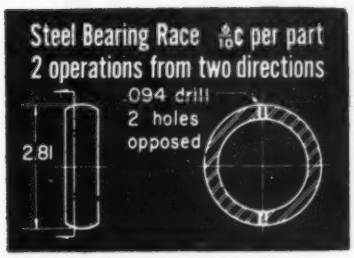
The unit cost of the machine:

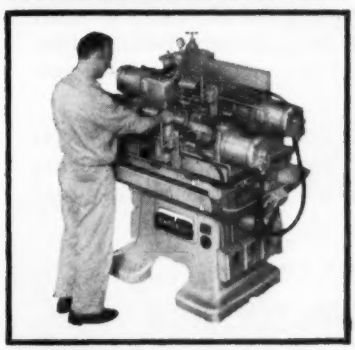
$$\frac{\text{price of tooled machine}}{\text{output in 6000 hrs. @ 80\% efficiency}}$$

The costs include just the man and the machine — no power or overhead. As to the 6000 hours, that's about three years for one shift — one year for three shifts.

If you want more information just drop us a line.

Sincerely,
Kingsbury Machine Tool Corp.
99 Laurel St., Keene, N. H.



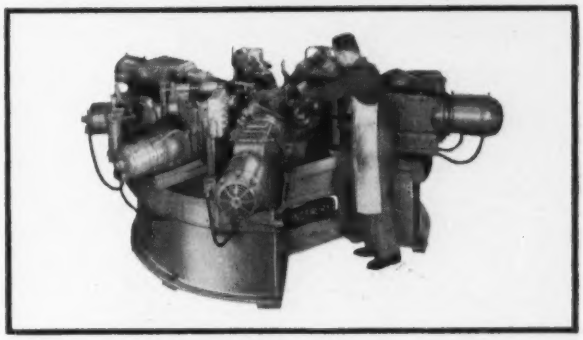


Production is 680 parts per hour gross.

⟵ Steel Bearing Race

2 Operations—from 2 Directions 6/10¢ per part

The machine on the left looks simple, doesn't it? It is, but it really produces. The operator of this double end machine puts in one piece and trips a lever. Air cylinders clamp the work and opposed units drill .094. While they are operating he loads another part into the rear fixture. With two fixtures, the operator can load one while the other is working — no waiting for operations to be completed. There's no indexing, just a 46 by 24 inch rectangular table.



Production is 330 parts per hour gross.

⟵ Cast Iron Transmission Drum

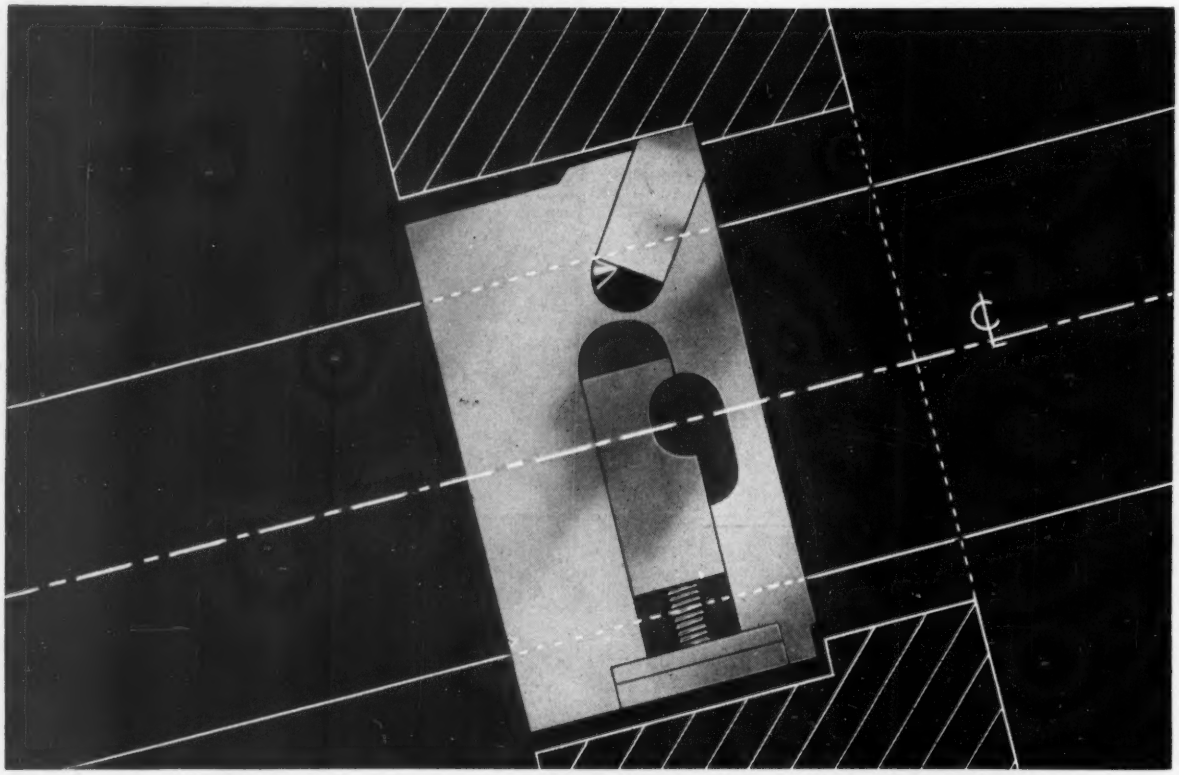
42 Operations 2 6/10¢ per part

Note the number of operations. (42 spindles are required, all working at once.) This Kingsbury machine has a 100-inch base and 30-inch index table. There are seven drilling units and one tapping unit. All are mounted horizontally and use auxiliary heads with from three to nine spindles each. Bushing carriers guide all tools but the taps. Each fixture is automatically unclamped as it indexes to the unloading station.

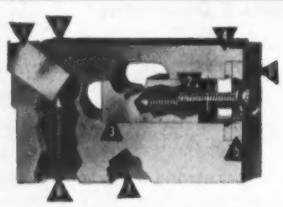
KINGSBURY

AUTOMATIC DRILLING & TAPPING MACHINES
for Low-Cost High Production

Get fast, positive line boring accuracy for 2½" to 17" dia. with...



DAVIS SINGLE CUTTER MICROMETER ADJUSTABLE BLOCKS



1. Cutter — Carried in stock of HSS or Tungsten Carbide tipped. Other materials per order.
2. Micrometer adjusting screw.
3. Gib — Hardened and precision ground to fit dovetail slot in block, allows for seating and accurately clamping of block with taper lock screw. The taper lock screw clamps the block firmly against the rear of the slot in the same manner as used in the Davis standard block type construction.
4. Keeper Plate — Retains adjusting screw.
5. Keeper Block — Retains adjusting screw.
6. Keeper Screws — Holds assembly in block.
7. Centers—For circle grinding cutter on diameter.
8. Cutter Support Screw — Supports and adjusts cutter for regrinding purposes.
9. Cutter Lock Screw—Locks cutter firmly in place.
10. Cover Plate — (Not Shown). Dovetailed to fit block prevents entrance of foreign matter into gib and screw assembly.

HERE's the way to boost efficiency on general purpose jobs that demand rigidity and a wide range of cutter adjustments.

In addition to regular line boring with either standard or special bars, Davis tools with the exclusive adjustable feature are easily adapted to counterboring, undercutting, grooving, facing or chamfering. Block and cutter adjust as a unit to assure full cutter support at all settings.

Made of high grade tool steel, hardened and ground, the blocks can be furnished with High Speed Steel, Cobalt, Stellite, Tungsten Carbide tipped or Tantalum Carbide tipped cutters.

For details, write for bulletin No. 602.

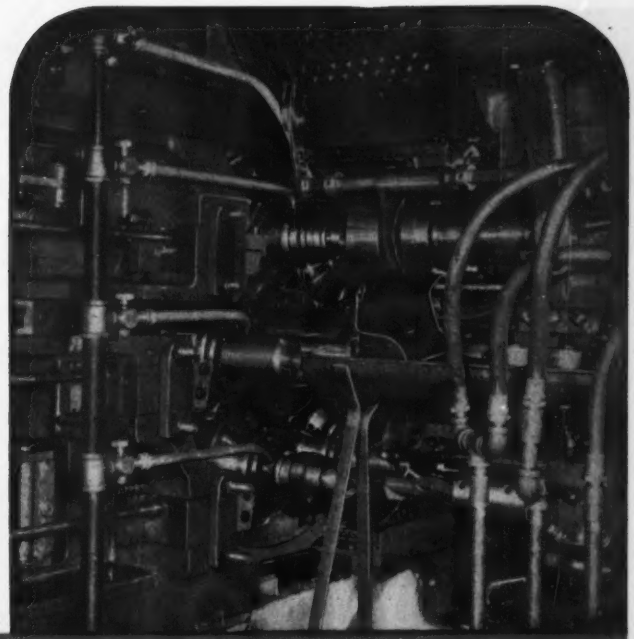
If Davis can't bore it, it can't be done!

DAVIS BORING TOOL DIVISION

GIDDINGS AND LEWIS MACHINE TOOL COMPANY

FOND DU LAC, WISCONSIN

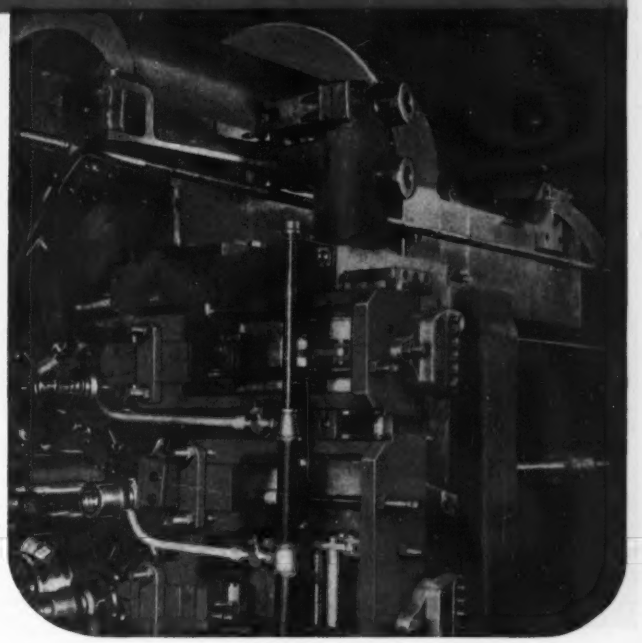
The main end slide of a 3½-SIX figures prominently in producing the above piece. Its total length is 34½ ins. Its diameter is 12 ins. Its swing for die heads, etc., is 4 ins. The maximum recommended load for the slide is 12,000 foot pounds. Its bearing area is approx. 258 sq. ins.



Front Side of Tooling Area

BETTER BEFORE THAN AFTER

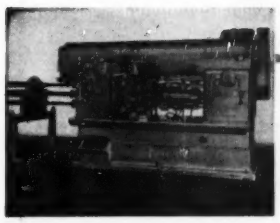
Rear Side of Tooling Area



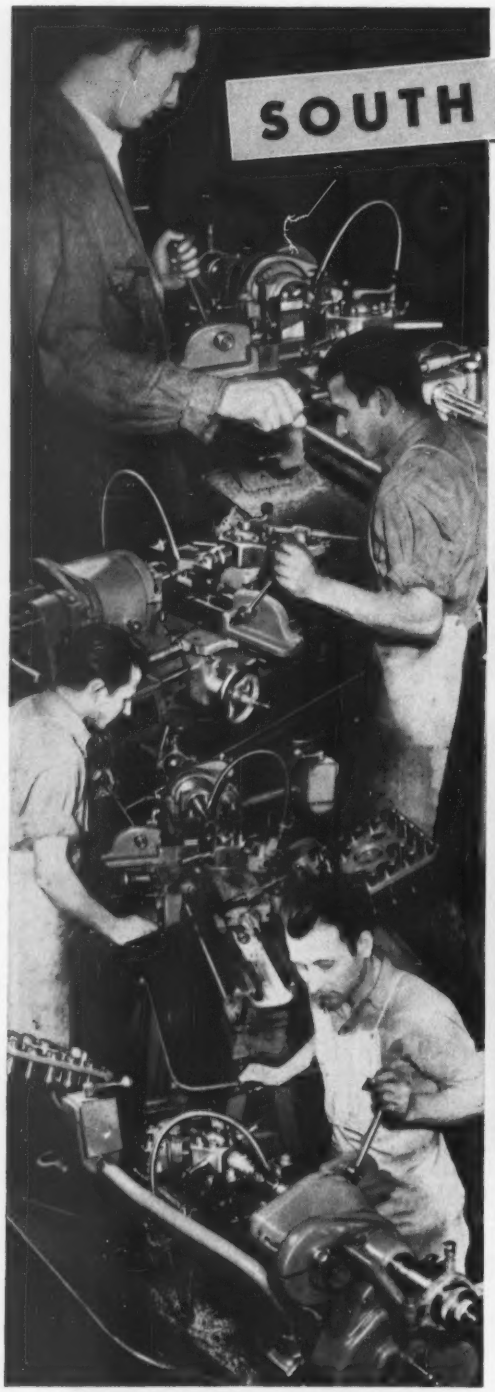
What an "automatic" does *after* it goes into production is information for which you have already paid a purchase price. How much more you will pay for operation and maintenance costs will determine the completeness and dependability of that information.

It is always better to have complete and dependable information *before* the purchase than after. You can have it on CONOMATICS.

A Comparison of ALL Automatics is in favor of Cone



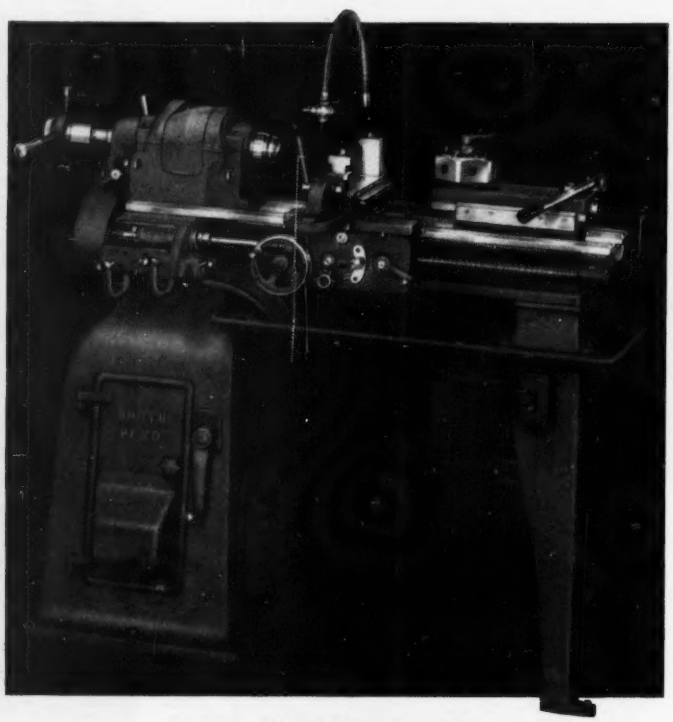
Conomatic } CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.



SOUTH BEND 1000 TURRET LATHE

Cost-Cutting Versatility

This precision turret lathe will cut your machining costs on small parts. Built-in accuracy, ease of operation and a wide range of speeds and feeds insure high production and close tolerances. Practical attachments simplify tooling the lathe for jobs which might otherwise require special fixtures. What's more, your least experienced operator will soon be a top producer on the 1000 Turret Lathe — it's that easy to run. Find out how this versatile turret lathe can improve your machining — *send coupon now.*



SPECIFICATIONS

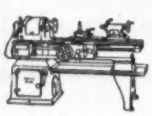
Swing	10-1/8″
Turret to Spindle	19-3/8″
Collet Capacity	1″
Spindle Bore	1-3/8″
Spindle Speeds	12
	50 to 1357 r.p.m.
Power Longitudinal Feeds	48
	.0015″ to .0836″
Power Cross Feeds	48
	.0006″ to .0309″
Thread Cutting Feeds	48
	4 to 224 per inch

AIR NATIONAL GUARD PROTECTS AMERICA

SOUTH BEND LATHE
South Bend 22, Indiana
Building Better Tools Since 1906

Send Information Checked:

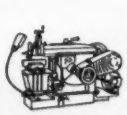
☐ _____ ☐ 9″ and 10″ BENCH LATHES



☐ 10″ to 16-24″ FLOOR LATHES

☐ ½″ and 1″ Collet TURRET LATHES

☐ 14″ DRILL PRESSES



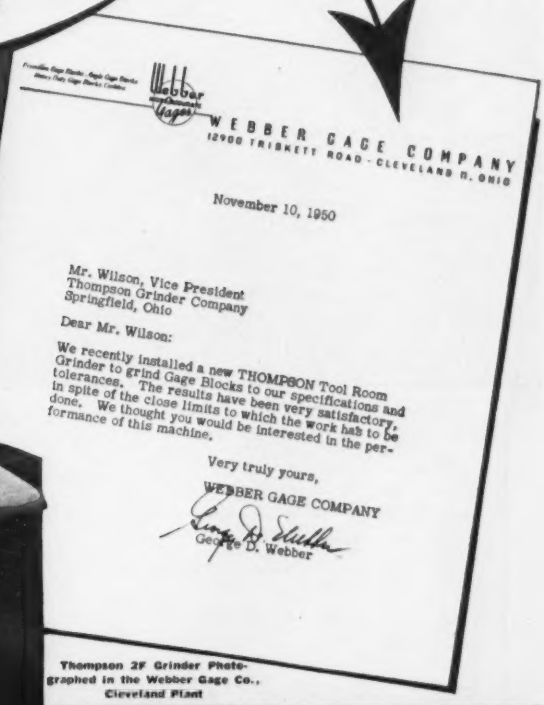
☐ 7″ BENCH SHAPERS

Name _____ Company _____

Street _____ City & State _____

Here's Proof

The New Thompson Type 2F is a SUPER PRECISION Tool Room Grinder



WEBBER GAGE COMPANY
12900 TRISKETT ROAD - CLEVELAND 11, OHIO

November 10, 1950

Mr. Wilson, Vice President
Thompson Grinder Company
Springfield, Ohio

Dear Mr. Wilson:

We recently installed a new THOMPSON Tool Room Grinder to grind Gage Blocks to our specifications and tolerances. The results have been very satisfactory, in spite of the close limits to which the work has to be done. We thought you would be interested in the performance of this machine.

Very truly yours,
WEBBER GAGE COMPANY
George D. Webber

Thompson 2F Grinder Photographed in the Webber Gage Co., Cleveland Plant

COMPARE THIS NEW 8 x 10 x 24 TOOL ROOM GRINDER

When working to a tolerance of four millionths of an inch such as is observed when making Webber Gage Blocks, the rough or preliminary grinding plays an important role in keeping cost of the final finishing within reasonable limits.

Compare These Features:

- HARDENED AND GROUND cross slide ways completely sealed.
- One shot lubrication to cross slide ways and internal saddle bearings.
- HARDENED AND GROUND sealed anti-friction vertical slide.
- HARDENED AND GROUND BED WAYS with automatic lubrication.
- 3600/1800 R.P.M. 2 speed wheel head. Heavy alloy steel spindle heat treated, runs in super precision ball bearings accurately preloaded, lifetime lubricated.

Handy control panel.

- Elevation micrometer stop graduated in .0001".
- GROUND THREAD FEED SCREW.
- Automatic wheel TRUING device.
- Longitudinal hand wheel with automatic engagement.
- Hydraulic head movement throttle with rapid traverse.
- Hydraulic table movement throttle.
- Elevating hand wheel graduated in .0005".
- GROUND THREAD FEED SCREW.

WRITE TODAY for complete specifications and performance data. Address Dept. 10, Thompson Grinder Co., Springfield, Ohio.

COPYRIGHT 1951 BY THE THOMPSON GRINDER CO.

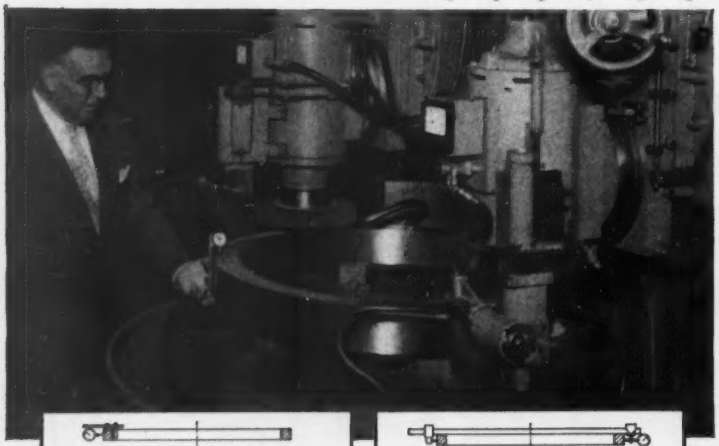
The only manufacturer of a complete range of heavy duty and light duty surface and contour grinders for industry.

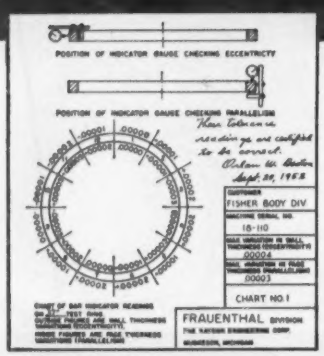
Thompson SURFACE Grinders

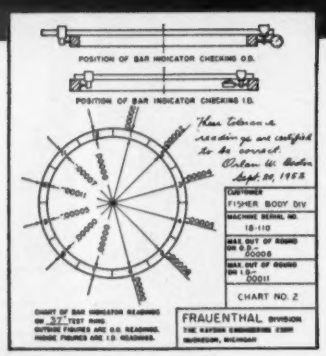
The Thompson Grinder Company, Springfield, Ohio

GRINDING TO millionths*

OF AN INCH







* *Our normal method of expressing tolerances in tenths-of-thousandths of an inch became inadequate when precision was attained to fractions of tenths-of-thousandths, expressed best in MILLIONTHS of an inch.*

Utmost precision proved by meticulous tests, and certified by Orlan W. Boston, Chairman, Department of Production Engineering, University of Michigan. He witnessed tests at Frauenthal plant in Muskegon and certified their validity on precision grinding of a 37-inch test ring, on Frauenthal Grinder No. 18-110 (shipped to Fisher Body Division for grinding tank bearings).

You get TOP PRECISION with Frauenthal Grinders

The certified readings listed at left are much closer than the 200-millionths of an inch precision specified for these machines. You can get similar results on other sizes of Frauenthal Multiple-Head Super-Precision Cylindrical Grinders, up to 140-inch diameter grinding on the Series 2200 machines. Uniformity of precision is assured in concentricity, parallelism and roundness. You can make many combination settings of grinding-spindle positions for a wide variety of simultaneous grindings of outside, inside and faces. Details on request.

PRECISION GAUGE READINGS • CHART NO. 1

MAX. VAR. IN FACE THICKNESS (Parallelism)				MAX. VAR. IN WALL THICKNESS (Eccentricity)			
Station	Reading	Station	Reading	Station	Reading	Station	Reading
1	.000000"	7	.000000"	1	.000000"	7	+.000020"
2	+.000010"	8	+.000020"	2	+.000010"	8	+000010"
3	+.000030"	9	+.000030"	3	+.000020"	9	.000000"
4	+.000030"	10	+.000030"	4	+.000020"	10	−.000010"
5	+.000030"	11	+.000030"	5	+.000010"	11	−.000020"
6	+.000010"	12	+.000020"	6	+000020"	12	−.000010"

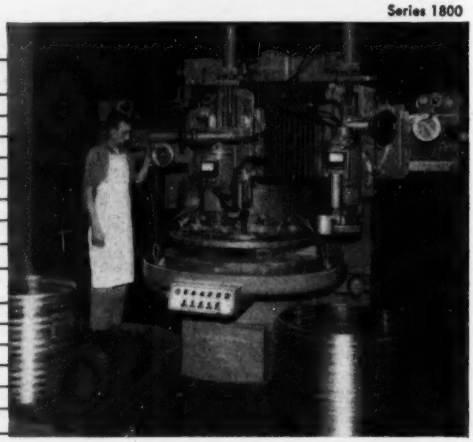
Maximum Variation in Parallelism: .000030" Maximum Variation in Eccentricity: .000040"

PRECISION GAUGE READINGS • CHART NO. 2

MAX. OUT-OF-ROUND ON O. D.				MAX. OUT-OF-ROUND ON I. D.			
Station	Reading	Station	Reading	Station	Reading	Station	Reading
1	.000000"	4	−.000050"	7	.000000"	10	−.000110"
2	−.000020"	5	−.000080"	8	.000000"	11	−.000070"
3	−.000040"	6	.000000"	9	−.000050"	12	.000000"

Maximum Variation, Outside Diam: .000080" Maximum Variation, Inside Diam: .000110"

Series 1800



What is YOUR Grinding Problem?

Through more than a decade of toolroom and production grinding, Frauenthal Grinders have been performance-proved on tough precision jobs, such as helicopters, jet engines, army and navy tanks and gunmounts, Diesel engines, machine tools, 120-inch diameter KAYDON precision bearings and similar products. We'll be glad to work with you on difficult grinding problems.

made in 10 standard sizes . . . conforming to essential J.I.C. specifications

	Series 1800	Series 2000	Series 2200
Table sizes	30" 36" 42" 48"	60" 72"	110" 120" 130" 140"
Maximum Swing	56" 56" 56" 56"	72" 88"	120" 130" 140" 150"

Ask for Bulletin

Frauenthal Division THE KAYDON ENGINEERING CORP., MUSKEGON, MICH.

PRECISION-GRIND INSIDE, OUTSIDE AND FACES SIMULTANEOUSLY

SCENE 114:
"3 Taps in 1"
...an actual scene from the GTD-Greenfield sound film "FACTS ABOUT TAPS AND TAPPING"
VOICE: "Sometimes a very special tap is the only solution to a difficult threading problem . . . Here we see a special tap designed by GTD–Greenfield engineers to enable a pump manufacturer to tap three concentric holes in one operation . . . Special taps may far offset higher initial cost in greater production on the job."
GREENFIELD
TAP AND DIE CORPORATION
GREENFIELD, MASSACHUSETTS
This 26-minute full-color motion picture "FACTS ABOUT TAPS AND TAPPING" is now available for group showing through your local GTD-Greenfield distributor.

THAT'S JUST THE POINT!

. . . . Yes, but a mighty important part of any Twist Drill. That's where the first contact comes, that's where hole size, roundness and surface smoothness are made or lost. That, in short, is the heart of the drilling operation.

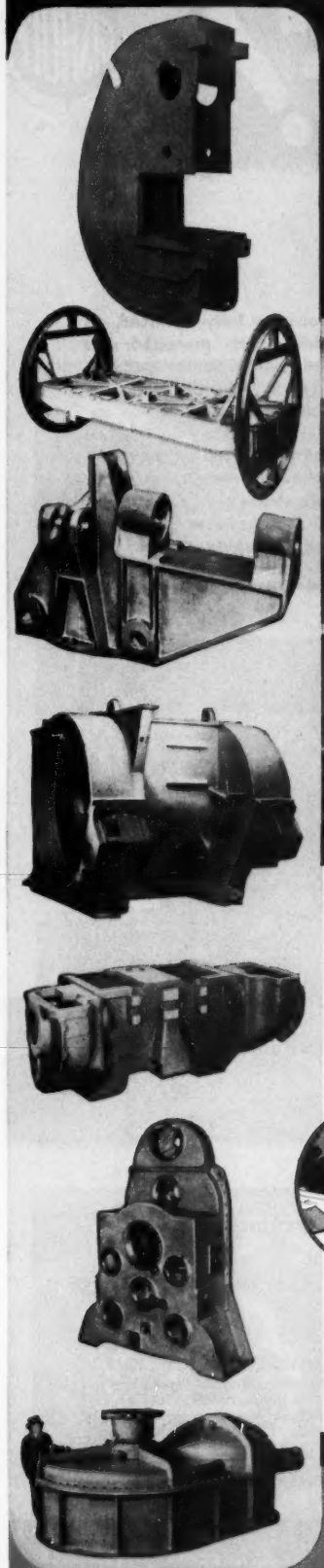
GTD-AMPCO Drills are made with special attention to point accuracy, but behind the point you'll find that GTD-AMPCO Drills are exceptional for concentricity of flutes and lands, regularity of margins, polished flutes for better chip slippage, *and* in sizes over 1 inch the exclusive GTD-Ampco feature . . . they're HAMMER-FORGED for extra toughness and longer wear life.

AMPCO TWIST DRILL DIVISION

GREENFIELD TAP AND DIE CORPORATION

GREENFIELD, MASS.

Steel-Weld FABRICATION



Use WELDED STEEL for Greater Strength with Less Weight!

In the illustration above you see a portion of the Mahon machine shop where welded steel parts and assemblies of various sizes and weights are machined to specification for many industries throughout the country. Facilities are available right in the Mahon plant to do the complete job from the drawing board to finished machining ready for assembly. If you have parts or assemblies that can be redesigned and produced to better advantage through Steel-Weld Fabrication, or, if you are faced with a production problem involving large heavy pieces in which pattern costs are a consideration, you can turn to Mahon with complete confidence. You will find in the Mahon organization a unique source with complete, modern fabricating, machining and handling equipment to cope with any type of work regardless of size or weight . . . a source where skillful designing and advanced fabricating technique are supplemented by craftsmanship which assures you a smoother, finer appearing job embodying every advantage of Steel-Weld Fabrication. See Mahon's Insert in Sweet's Product Design File, or write for further information.

THE R. C. MAHON COMPANY
DETROIT 34, MICHIGAN

Engineers and Fabricators of Steel in Any Form for Any Purpose

MAHON

LONG LIFE!

1

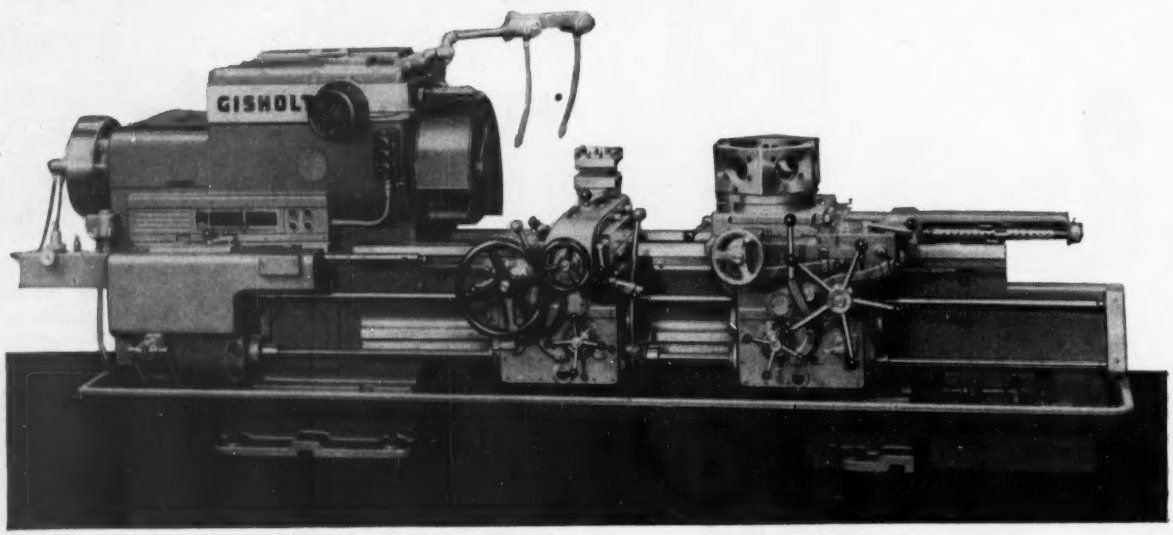
All gears in Gisholt turret lathe transmissions are high carbon alloy steel, precision ground after heat-treatment to assure long wearing quality. All shafts turn on antifriction bearings, with pressure spray lubrication. Headstock is cast integral with bed for extreme rigidity—to maintain accurate, permanent alignment.

2

Gisholt's thick, block-type ways are automatically pressure lubricated. Made of SAE 52100 tool steel, they are deep hardened to 64-66 Rockwell C and then finish-ground for exact alignment with the spindle. On top, bottom and both sides, they present a bearing surface that is virtually wear-proof—accurate for years to come.

3

Aprons are fully enclosed, all working parts protected and operating in a continuous cascade oil bath. Alloy steel gears and shafts are mounted on antifriction bearings. Positive serrated feed and traverse clutches cannot slip or drag. Safety shear pins protect feed and traverse mechanism against overload and accident.

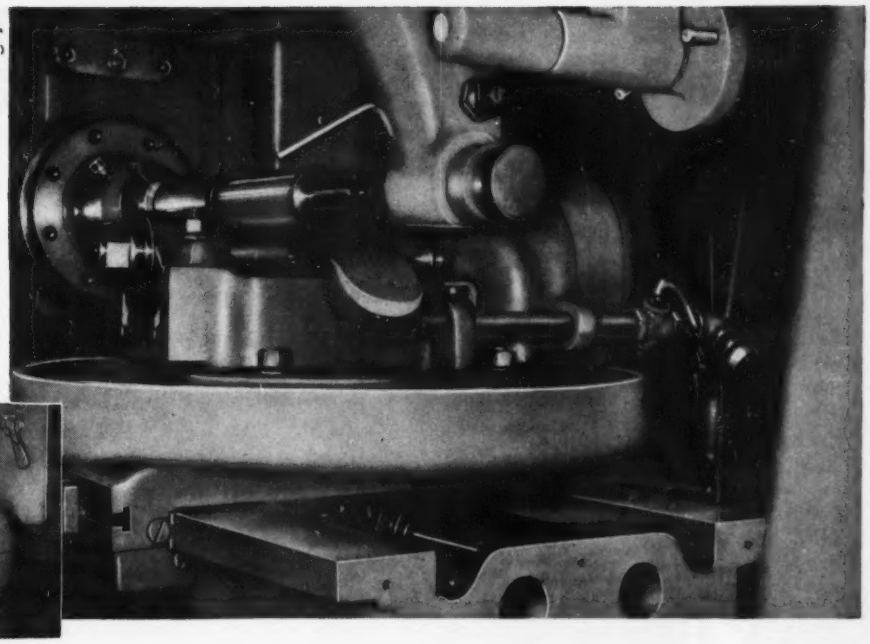


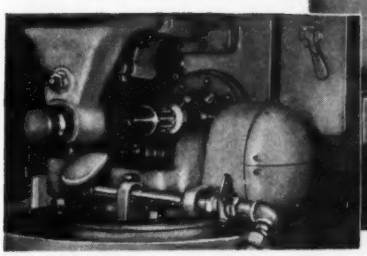
You'll find all the speed and easy operation you want in these new Gisholts. But you want long life, too. Here's the lasting accuracy, freedom from repair bills and proved performance that protect your turret lathe investment for years to come.

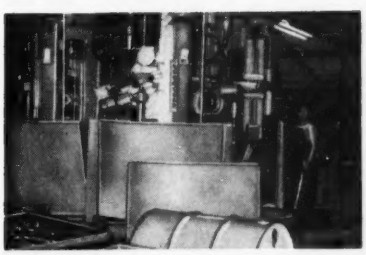
GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

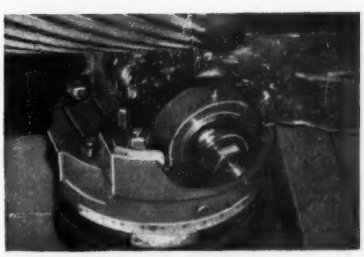
THE GISHOLT ROUND TABLE
represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

TURRET LATHES · AUTOMATIC LATHES · SUPERFINISHERS · BALANCERS · SPECIAL MACHINES









"ON-THE-JOB" CUTTING OIL TESTS BY CITIES SERVICE ENGINEERS!

at Timken-Detroit Axle Company

TOOL WEAR REDUCED 25%...MANUFACTURING COSTS ALSO CUT!

In an effort to reduce tool wear and cut manufacturing costs, the Wisconsin Division of Timken-Detroit Axle Company at Oshkosh called in Cities Service Engineers to make "on-the-job" tests.

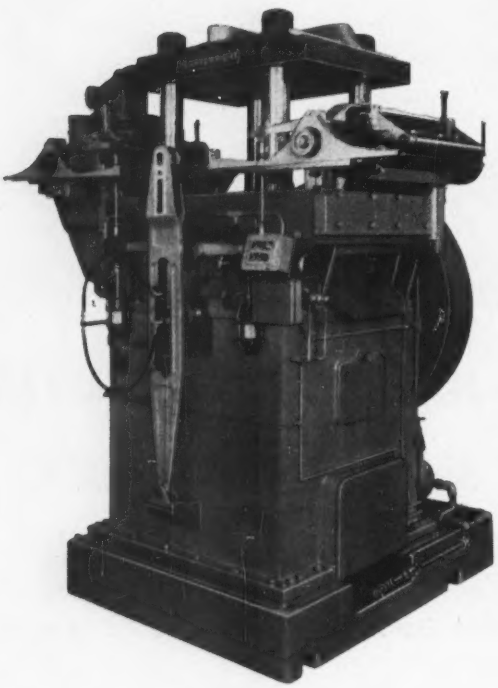
Cities Service Lubrication Engineers made an on-the-spot study of the Timken-Detroit operation. This "on-the-job" evaluation by skilled Cities Service Engineers, long practiced in solving like problems, resulted in a recommendation for the use of a Chillo Cutting Oil that actually reduced tool wear 25% with proportionate savings in manufacturing costs!

WHAT ARE YOUR PROBLEMS? Why not take advantage of free, "on-the-job" testing? Call for our lubrication engineers at the office nearest you, or write Cities Service Oil Company, Dept. D12, Sixty Wall Tower, New York City 5, New York.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

A PROFIT WITH EVERY STROKE



Our customers say that. It figures. One Dieing Machine does the work of five to ten conventional stamping presses. One stroke—a complete part. One inspection. One trip for parts removal. Speed—you can pull out the throttle. Die life—longer for two reasons. (1) Stability, minimum vibration, extreme precision of tools alignment. (2) Dies take less of a beating; less metal needs to be removed for sharpening. Our men can give you the whole Dieing Machine story. If you want to cut costs, now's the time to talk to one of them—a note from you will have an H & W man on deck promptly.

NEW CATALOG Up-to-the-minute facts on Dieing Machines. Capacities now range from 25 tons to 2500 tons. Catalog gives specifications up to 400-ton machine. Write Henry & Wright, 461 Windsor St., Hartford, Connecticut.

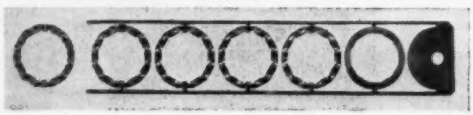
HENRY & WRIGHT

DIVISION OF EMHART MFG. CO.

HARTFORD 1, CONNECTICUT

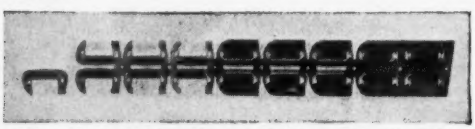
TYPICAL JOBS THAT SHOW A PROFIT AT EVERY STROKE

Automotive stamping produced complete per stroke from 5/32" thick by 13" wide hot rolled steel in coils on 200-ton Dieing Machine, single gear type, equipped with progressive die. Speed approximately 45 strokes per minute.

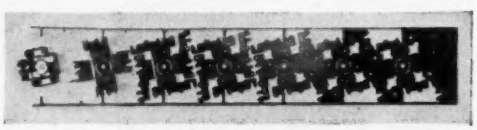


Ball bearing retainer produced complete in 75-ton Dieing Machine operating at speed of 95 strokes per minute. Made from 4⅜" wide by .034" thick cold rolled steel.

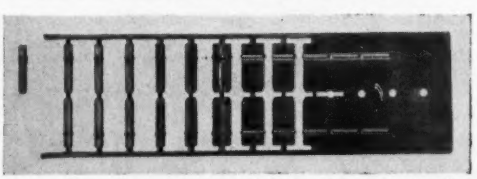
Ferrule. One completed piece produced per stroke in 50-ton Dieing Machine operating at speed of 90 strokes per minute. Made from 5/16" diameter by ⅞" long by .030" thick cold rolled steel.



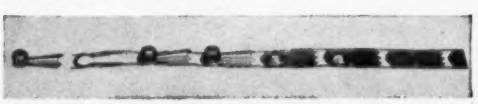
C-Clamp Frame. Both halves produced complete in 150-ton Dieing Machine operating at speed of 65 strokes per minute. Material—cold rolled steel .086" by 4⅜" wide.



Support bracket produced complete one per stroke in 150-ton Dieing Machine operating at speed of 60 strokes per minute. Made from .062" thick by 7¼" wide cold rolled steel.



Radio tube prong produced complete in 25-ton Dieing Machine at rate of 450 pieces per minute. Made from brass .012" by 1 7/16" wide.



Bathroom fixture produced in 60-ton Dieing Machine operating at speed of 100 strokes per minute. Made from .032" thick by 1¾" wide cold rolled steel.

Hardware item. One completed piece produced per stroke in 100-ton Dieing Machine operating at speed of 75 strokes per minute. Made from 3" wide by .040" thick cold rolled steel.

UNIVERSAL DRILL BUSHINGS

GIVE YOU ALL THESE OUTSTANDING FEATURES

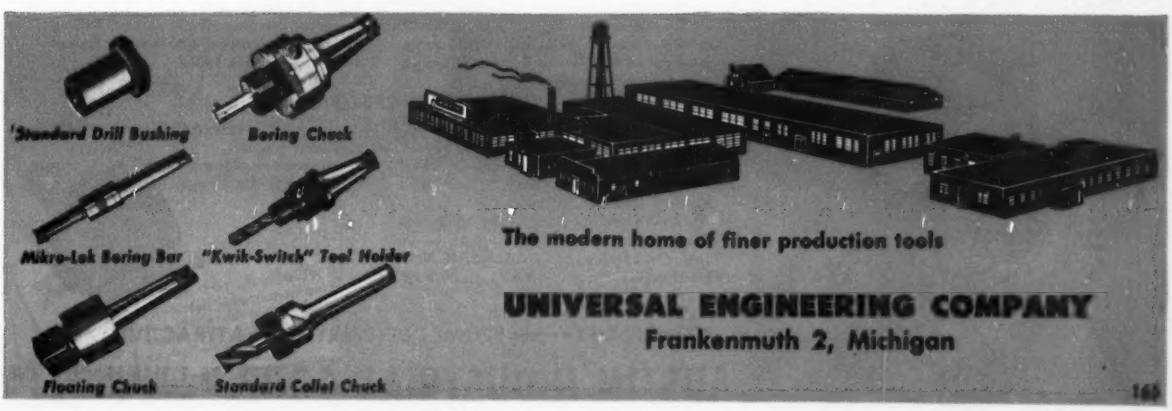
1—super finish reduces wear to a minimum

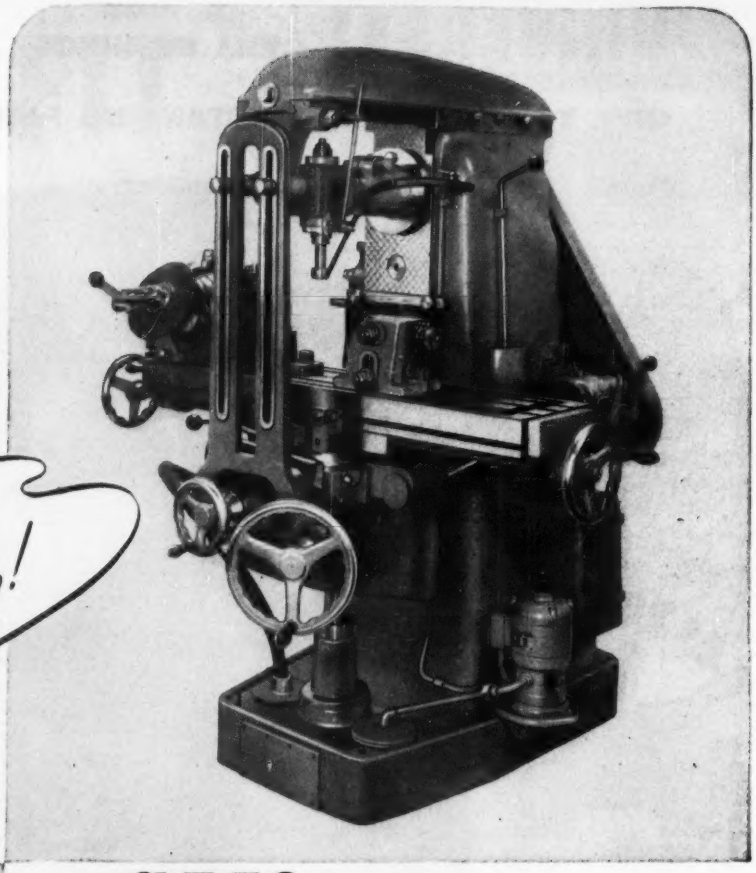
5—complete variety of sizes and lengths

2—blended radius reduces tool hang up

4—knurled head provides quick sure grip

3—100% concentricity and hardness tests assure accuracy





Swedish Craftsmanship!

Sajo Vertical Milling Attachment

The Sajo "Plain" Milling Machine

the SAJO "UNIVERSAL" MILLING MACHINE

exemplifies the expert workmanship that is traditional in Swedish machine tools. Like all SAJO Millers, this new Universal Milling Machine was designed and built to the highest standards of quality and practical utility.

Avoidance of exterior "luxury" features, slight in value but substantial in cost, and concentration on the vital factors of construction, enable the SAJO to deliver top performance at moderate cost.

SAJO Millers are available in Plain and Universal types, with longitudinal power table feed only, or with power feed in all directions. Screws and dials are in the U. S. inch system.

★ **Standard Equipment Includes:**
3 HP motor and starter equipment, motor driven coolant system, adjustable table feed nut to allow climb-milling, 1" arbor, arbor support brace.

★ **Extra Equipment:**
Universal Dividing Head, Vertical Milling Attachment, Slotting Attachment, Swivel Base Vise, Rotary Table.

CONDENSED SPECIFICATIONS

Table Size	41⅛" x 9¼"
Longitudinal travel: Plain Miller	24½"
Universal Miller	27½"
Transverse travel	8¼"
Vertical travel	19"
12 spindle speeds	36-1540 RPM
Table feeds	12
Taper in spindle	No. 40 NMT
Main motor	3 HP

Precision anti-friction bearings on spindle and gear shafts
One-piece column and base
Net weight—2200 lbs.

Write for Catalog

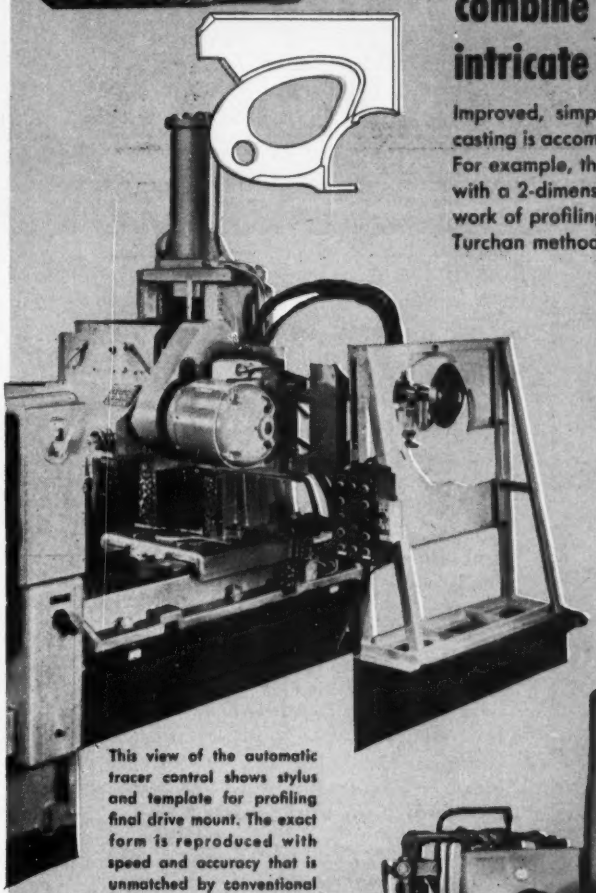
NO PRIORITY—— PROMPT DELIVERY——ATTRACTIVE PRICE

AUSTIN INDUSTRIAL CORP. 76-E MAMARONECK AVE. WHITE PLAINS, N. Y.
DEALERS IN PRINCIPAL CITIES

Turchan and FORNEY

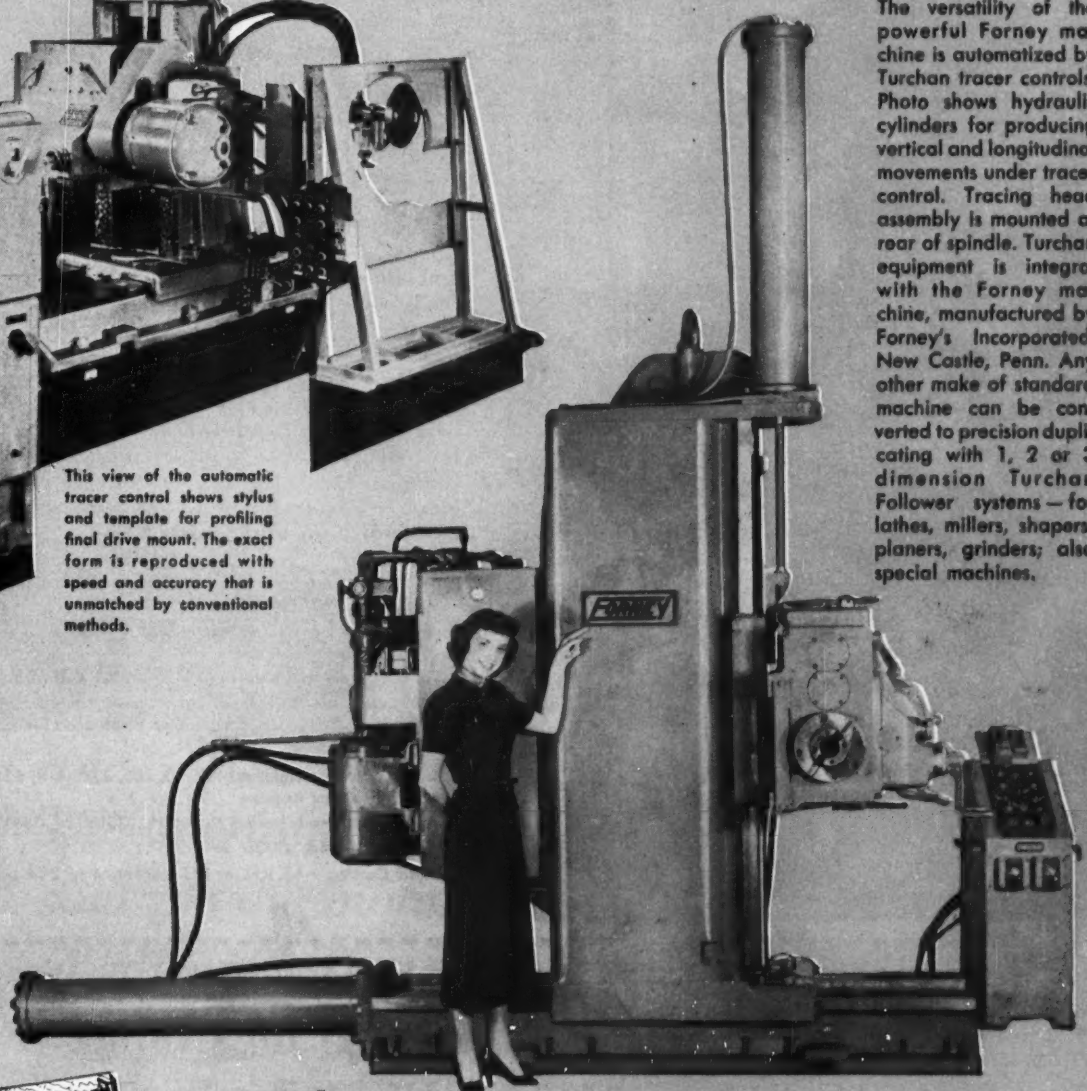
combine skills to simplify machining of intricate final drive mount for the M-48

Improved, simplified machining of this irregular part from armor plate casting is accomplished, in several plants, with the aid of Turchan Followers. For example, the Forney Horizontal Boring and Facing Machine, equipped with a 2-dimension Turchan Hydraulic duplicating attachment, makes easy work of profiling and boring the various openings in this final drive mount. Turchan method of tracer-controlled duplicating saves up to 60% in time.



This view of the automatic tracer control shows stylus and template for profiling final drive mount. The exact form is reproduced with speed and accuracy that is unmatched by conventional methods.

The versatility of the powerful Forney machine is automatized by Turchan tracer controls. Photo shows hydraulic cylinders for producing vertical and longitudinal movements under tracer control. Tracing head assembly is mounted at rear of spindle. Turchan equipment is integral with the Forney machine, manufactured by Forney's Incorporated, New Castle, Penn. Any other make of standard machine can be converted to precision duplicating with 1, 2 or 3 dimension Turchan Follower systems — for lathes, millers, shapers, planers, grinders; also special machines.



Write for Bulletin
Gives full information on the many advantages of Turchan automatic tracer-controlled duplicating.

Do you have a machining problem? Send specifications of job. Give make and model of machine. We'll show you how to produce it better, faster, at lower cost.

Turchan FOLLOWER MACHINE COMPANY
8259 LIVERNOIS AVENUE · · · DETROIT 4, MICHIGAN

13" TOOLROOM LATHE

SOUTH BEND 13" LATHES

for accurate, low-cost machining

South Bend 13" Lathes are popular where there is a variety of precision parts to be machined. Costs drop as their accuracy and efficiency keep production flowing fast even on the "headache" jobs. Operators prefer them for their simplicity and practically effortless handling. Also, set-ups and change-overs are made so quickly and easily that down-time is held to a minimum.

Now is the time to find out how these quality-built lathes can also bring you better machining at lower costs. Let your near-by South Bend distributor show you how they can ease your production, toolroom and maintenance machining problems. Or, mail coupon for literature on the 13" Toolroom and Quick Change Gear models.

SPECIFICATIONS

Swing—13⅛" over bed and saddle wings, 8" over saddle cross slide.

Distance Between Centers—28¼", 40¼" and 52¼".

Collet Capacity—1" maximum (collets interchangeable with 10"–1", 14½", 16" and 16–24" South Bend lathes).

Spindle Bore—1⅜".

Spindle Speeds—Eight; 40, 60, 90, 135, 270, 418, 628 and 940 r.p.m. approx.

Longitudinal Feeds—48 R.H. or L.H., .0015" to .0841".

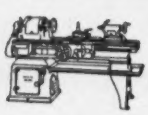
Cross Feeds—48, .0006" to .0315".

Thread Cutting—48 R.H. or L.H. pitches, 4 to 224 per inch.

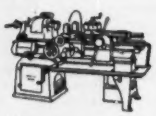
SEND INFORMATION CHECKED:

☐ _____

☐ 9" and 10" BENCH LATHES

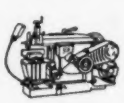


☐ 10" to 16-24" FLOOR LATHES



☐ ½" and 1" Collet TURRET LATHES

☐ 14" DRILL PRESSES

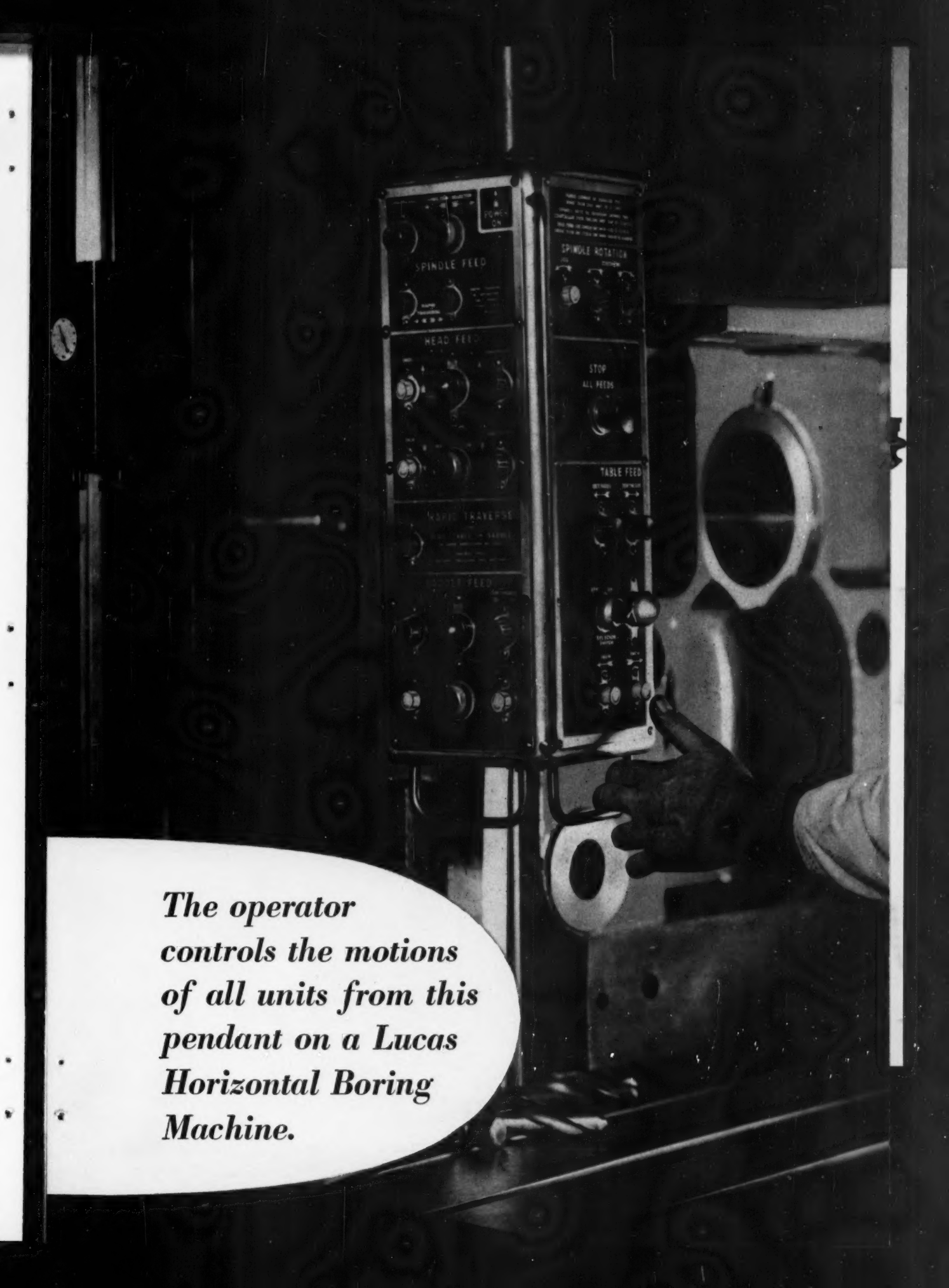


☐ 7" BENCH SHAPERS

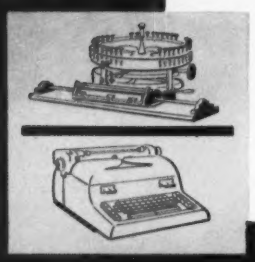
Name _____ Company _____

Street _____ City & State _____

Building Better Tools Since 1906 • **SOUTH BEND LATHE** • South Bend 22, Indiana



The operator controls the motions of all units from this pendant on a Lucas Horizontal Boring Machine.



Machines for Making Progress

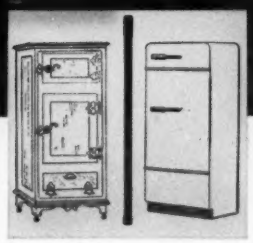
THE price of a thousand things like typewriters, refrigerators, and hardware **must** be kept within people's reach. Otherwise progress stops short and business hits the skids.

The improved metalworking efficiency of machines like New Britains and Lucases have kept manufacturers' costs from sailing out of sight as a result of high material costs, wage hikes and soaring taxes.

Have you made full use of really modern machines in your own business since World War II? Or will high manufacturing costs threaten your ability to compete successfully when the going gets tough?

New Britain four, six and eight spindle Automatic Chucking Machines set the standard for industry because

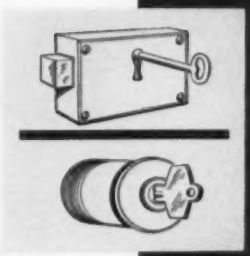
AUTOMATIC BAR AND CHUCKING MACHINES •
LUCAS HORIZONTAL BORING, DRILLING &
NEW BRITAIN +GF+ COPYING



they are designed from the ground up for their specific job. Open end construction provides maximum accessibility to all tools plus convenient chip removal. Built with the rigidity for the heaviest cuts and fastest speeds. Many exclusive features assure permanent accuracy.

The New Britain +GF+ Copying Lathe is built on a new principle, with copying saddle mounted below the spindle and no conventional bed to accumulate chips which fall free and accumulate through the back of the machine. Every control is at the operator's finger tips and the template or prototype is also on the operator's side of the machine. Powerful drive and a wide range of speed and feed ranges make the New Britain +GF+ a profitable producer on short or long runs

A Lucas Precision Horizontal Boring, Drilling and Milling Machine combines the accuracy required in jig and fixture work with the power and rigidity for heavy milling operations. Pieces ranging from small dies to very large pieces weighing up to 50 tons may be handled on a Lucas. Automatic Power Positioning makes it a time and money saver for long run repeat operations as well as fast single setups.

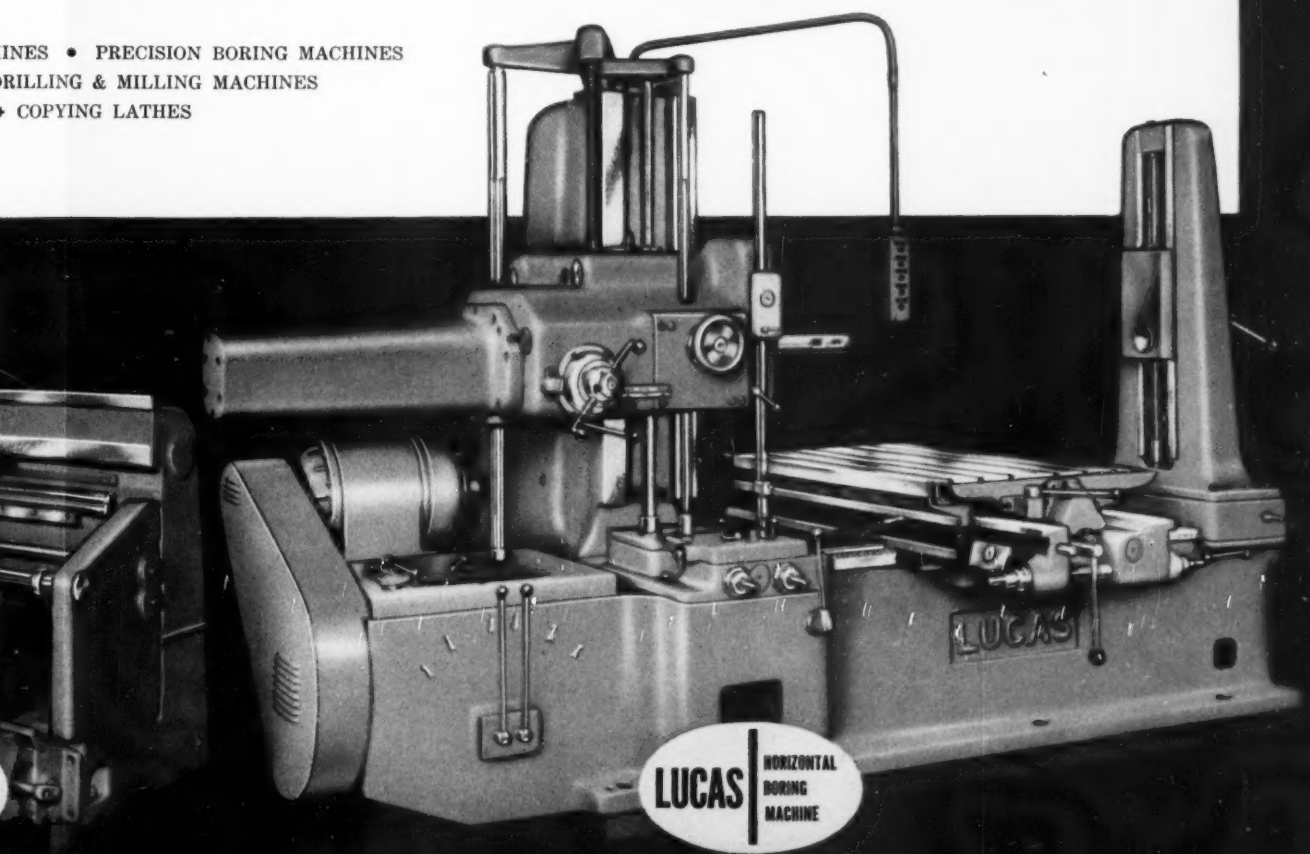


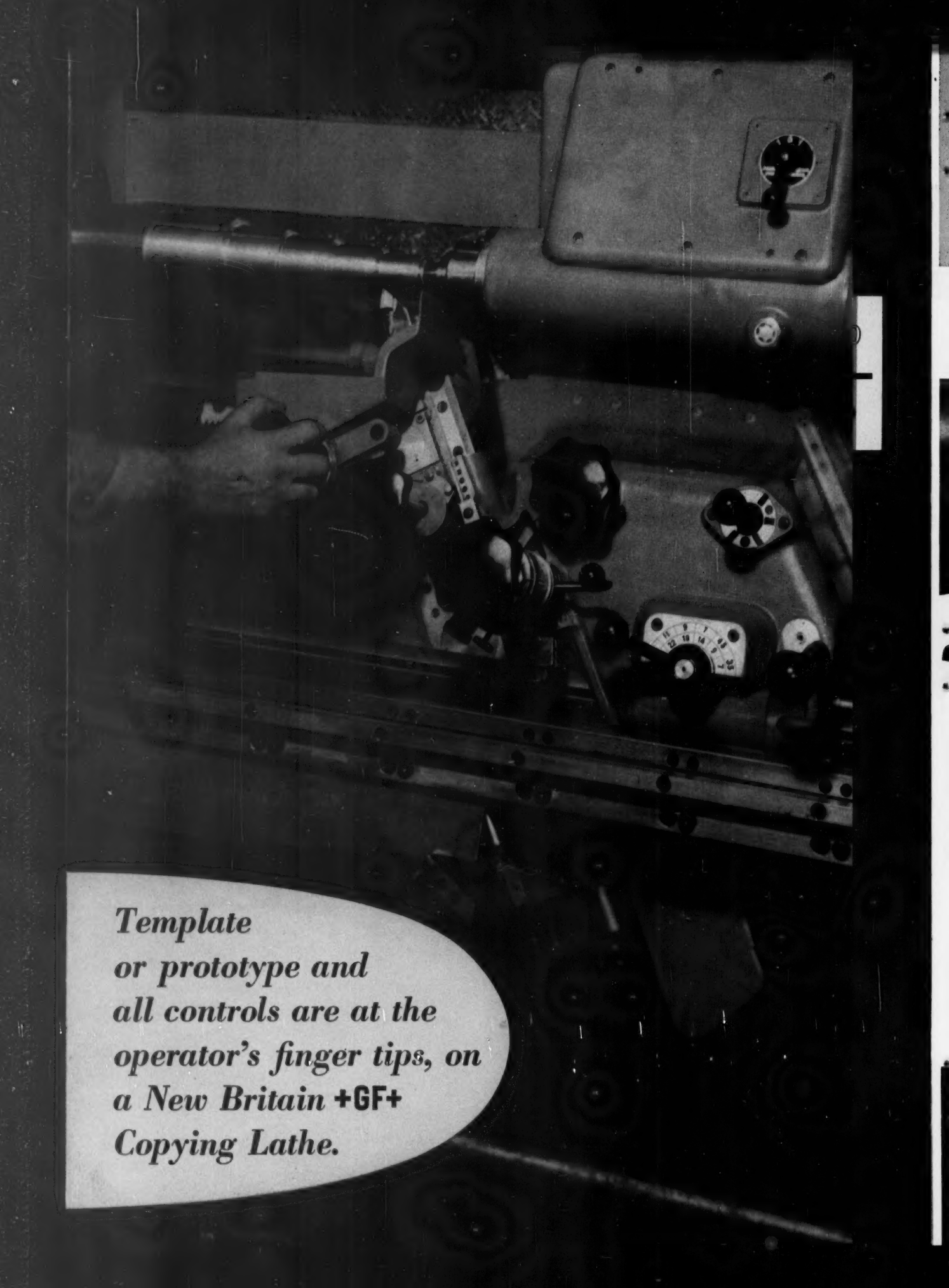
THE NEW BRITAIN MACHINE COMPANY

New Britain-Gridley Machine Division
New Britain, Connecticut

Lucas Machine Division
Cleveland 8, Ohio

INES • PRECISION BORING MACHINES
RILLING & MILLING MACHINES
+ COPYING LATHES



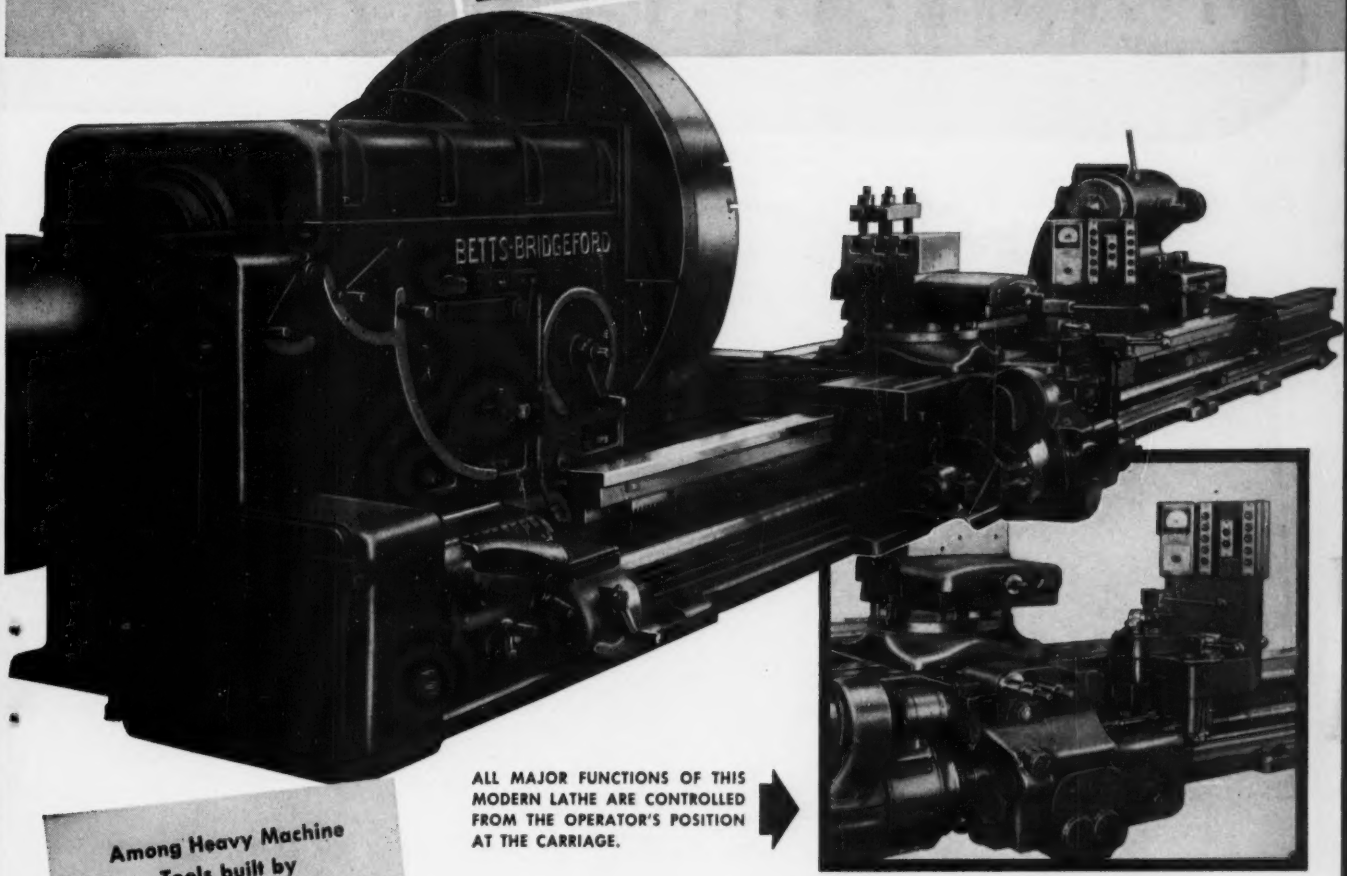


Template or prototype and all controls are at the operator's finger tips, on a New Britain +GF+ Copying Lathe.

BETTS-BRIDGEFORD

ELECTRONIC FEED

60" HEAVY DUTY LATHE



ALL MAJOR FUNCTIONS OF THIS MODERN LATHE ARE CONTROLLED FROM THE OPERATOR'S POSITION AT THE CARRIAGE.

Among Heavy Machine Tools built by Consolidated are . . . .

LATHES
BORING MILLS
DRILL PRESSES
MILLING MACHINES
BORING MACHINES
COLD SAW MACHINES
BORING, DRILLING AND MILLING MACHINES
DRILL AND TOOL GRINDERS
PLANERS
SLOTTERS
RAILROAD SHOP TOOLS
AUTOMOTIVE TOOLS
AND OTHER SPECIAL MACHINES

- Wide speed range permits use of either high speed steel or carbide tools.
- Feed and traverse functions entirely independent of thread cutting mechanism.
- Feed rate and cutting speed, within the range of their respective motors, are adjustable independently without interrupting the cut.
- Lead screw for thread cutting only.
- All anti-friction bearing headstock.
- Hardened steel bedways.
- Main drive motor speeds and feed and traverse functions are conveniently controlled from the operator's position at the carriage.

- Altogether, this modern lathe embodies the advanced features necessary to meet today's demand by industry for high production with greater accuracy and durability. Full information on this lathe or other Betts-Bridgeford Heavy Duty Lathes from 26" to 144" and larger will be furnished upon request.

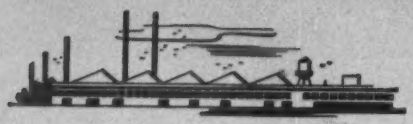
BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848

BETTS • BETTS-BRIDGEFORD • COLBURN • HILLES & JONES • MODERN • NEWTON • SELLERS

CONSOLIDATED MACHINE TOOLS

CONSOLIDATED
MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

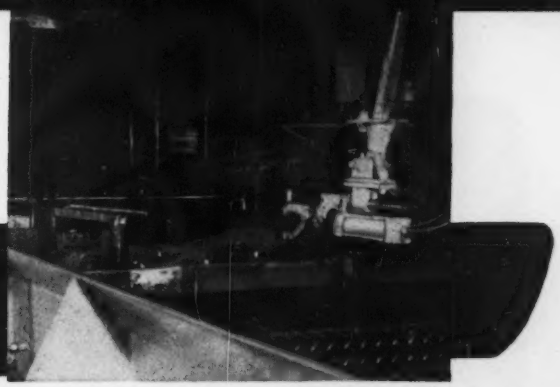


the "ANCHOR MEN" of the production team

DANLY PRESSES *help Ford*

View of front floor pan stamping line in Ford's new Buffalo Stamping Plant. Both big presses shown are Danly Underdrives. They are placed astride a continuous conveyor line which is part of Ford's remarkable "automation" system of material handling.

maintain uninterrupted output

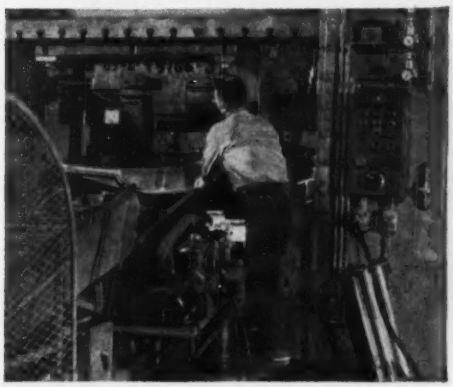


Looking into the dies of a Danly Underdrive Press on the front floor pan stamping line. Note the "iron hand" ready to remove the part after trimming operation is complete. Pneumatically powered and activated by a limit switch, the "iron hand" places the piece on a conveyor for transportation to the next press.

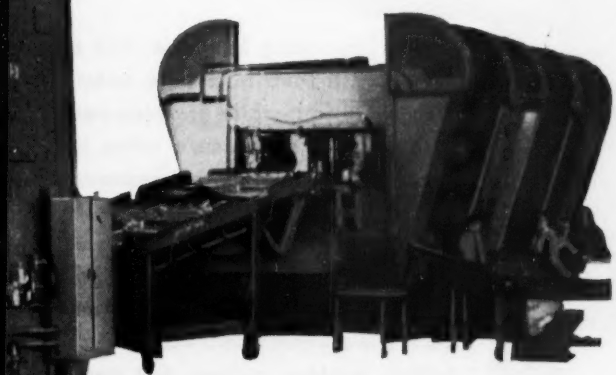
Non-stop production is the watch word in Ford's huge new Buffalo Stamping Plant. Approximately 40% of all Ford stampings come from here . . . the result of peak capacity, minimum cost operation.

Up and down all 19 major stamping lines you'll find Danly Presses . . . each one a vital link in the chain of uninterrupted production. With exclusive features like the Cool Running Clutch and automatic oil lubrication, it's no wonder you see so many Danly Presses in leading stamping plants throughout the country.

Built for top performance, Danly Presses are always ready and able to help you set new *continuous* production records.



Inner door panels are being fed into this Danly Press where trimming and piercing operations are performed. Note how die block hanging on press behind operator is chained to plug in control circuit. Press cannot be inadvertently operated when block is in die opening. Conveyor is controlled by operator's foot switch.



View of inspection operation at end of front floor pan stamping line. Locations of pierced holes in pan are being checked against master profile fixture with plug gauges.

It costs less to run a DANLY PRESS

Single Action Straight Side

Autofeed

Underdrive Single, Double Triple Action

Gap Frame

Double Action Straight Side

MECHANICAL PRESSES... 50 TO 3000 TONS
HYDRAULIC METALWORKING EQUIPMENT

DANLY

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue, Chicago 50, Illinois

many a tough milling machine problem has been solved by a . . . KEMPSMITH distributor

He's got the

- ☆ FACILITIES
- ☆ EXPERIENCE
- ☆ TRAINING
- ☆ SKILL

KEMPSMITH DISTRIBUTORS

ATLANTA, GA.	W. P. Childs — Machinery
BIRMINGHAM, ALA.	Geo. M. Meriwether
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CHICAGO, ILL.	Neff, Kohlbusch & Bissell, Inc.
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HOUSTON, TEXAS	Rex Supply Corporation
INDIANAPOLIS, IND.	State Machinery Company
KANSAS CITY, MO.	English Brothers Machy. Co.
LOS ANGELES, CALIF.	Tornquist Machinery Co.
MEXICO	Sabin St. Germain & Asso., Inc.
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You'll like doing business with a Kempsmith Distributor! He understands milling machine problems and he's ready at a moment's notice to give you the benefit of his engineering skill, service facilities and broad technical experience. What's more, he is available when you need him, always dependable in the pinches. So, if you are confronted with a tough milling machine problem, just reach for your phone . . . call your nearest Kempsmith Distributor.

THE KEMPSMITH MACHINE CO.
MILWAUKEE 14, WISCONSIN, U. S. A.

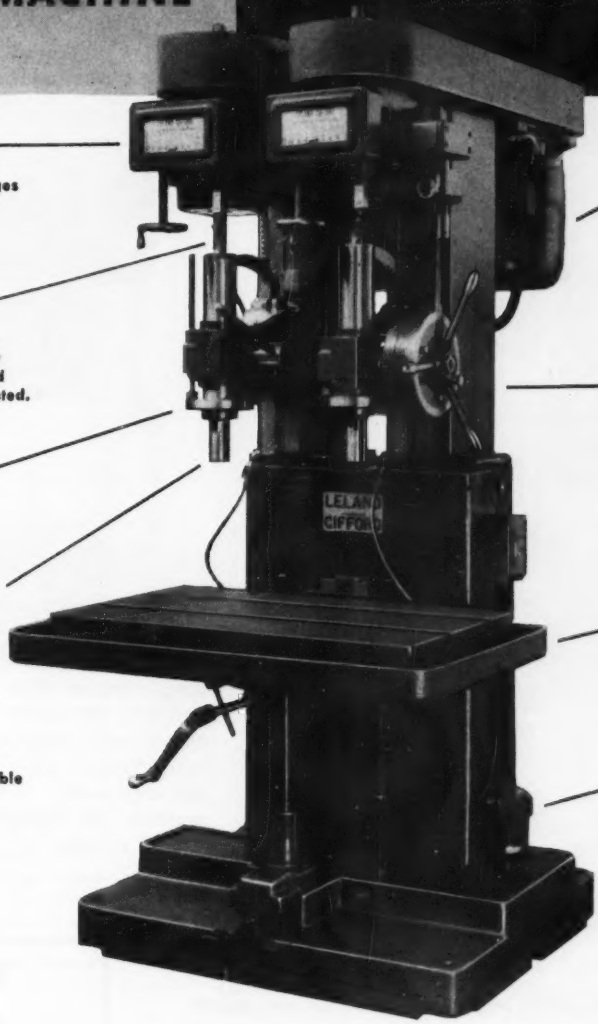
KEMPSMITH

Precision Built Milling Machines Since 1888

ALL THE FEATURES YOU WANT IN A HEAVY DUTY DRILLING MACHINE

the new

LELAND-GIFFORD No. 3 MVB



Leland-Gifford indicating shift for instant speed changes without stopping machine.

20-tooth involute spline spindle for greater rigidity, less wear. Independently counterbalanced and continuously lubricated.

Flanged quill for mounting multiple (spindle) heads.

Capacity of No. 3 or No. 4 Morse Taper.

Base, column and table ruggedly built for maximum rigidity.

Totally enclosed, fan cooled, ball bearing NEMA motor mounted at rear and driving through V belts.

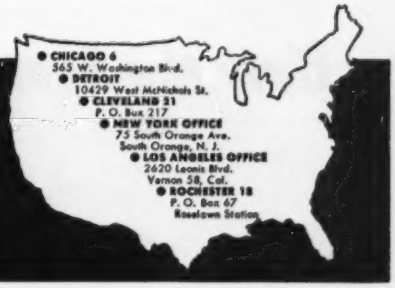
Semi-automatic power feed with 3 feed rates, automatic adjustable depth stop and safety slip clutch. Hand or hydraulic feed also available.

New design table with removable top for easy refinishing.

Coolant pump and tank readily accessible for cleaning.

24" SWING
1 to 4 SPINDLES

Write For Complete Information



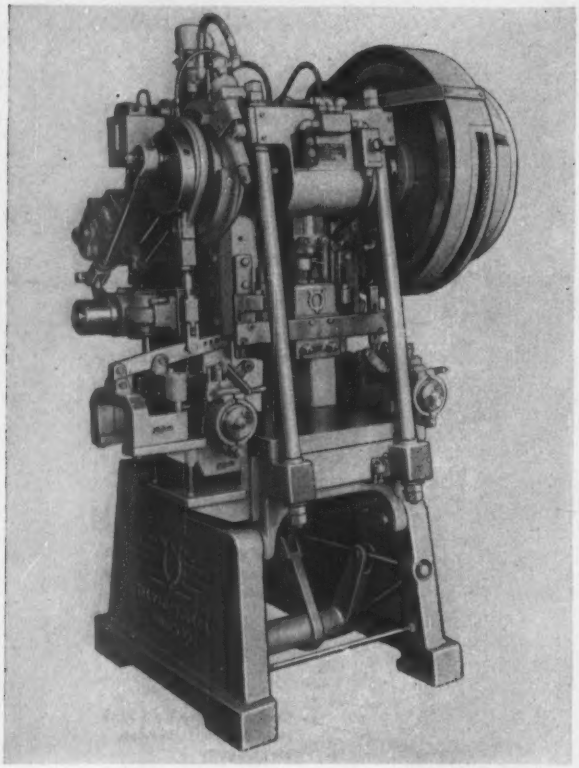
LELAND-GIFFORD

Drilling Machines

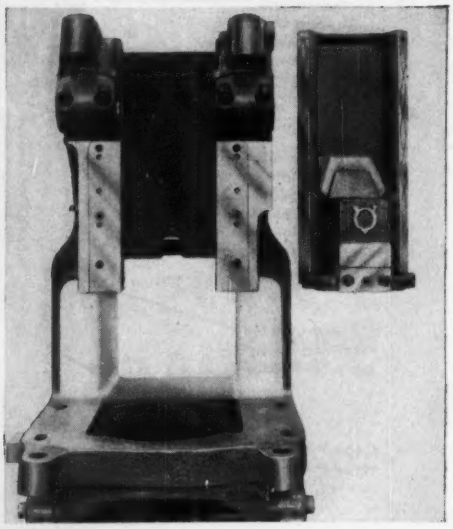
WORCESTER 1, MASSACHUSETTS, U.S.A.

Precision *all through* the power stroke is what makes precision stampings. Of course, the tools must be made accurately and set up right. But no tools can work more precisely than the machine that operates them.

FOR PRECISION STAMPING GO V & O



Plenty of room to attach tooling. Special engineering if you want it. Special equipment if you want it. You get the right degree of quality control at the right cost when you go V & O.



Long slides on V & O presses minimize the possibility of angular misalignment during the power stroke. Accuracy in every working member, stiffness in every load bearing part: these are only a few of the features that assure precision all through the power stroke on V & O presses.

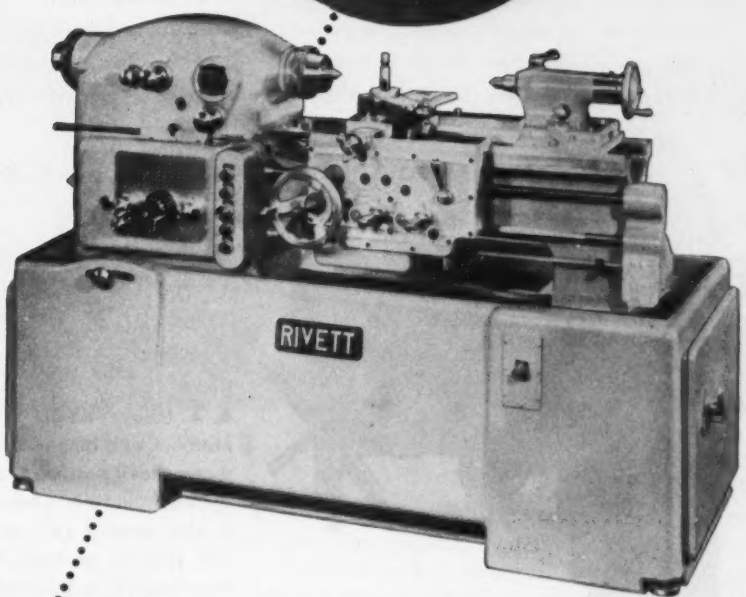
We would like to show you all the reasons why V & O presses deliver precision all through the power stroke. A representative is near you.

Only the best is good enough

DESCRIPTIVE CATALOGS containing complete specifications and operating details on V & O Precision Power Presses and Feeds are available. Please write The V & O Press Company, 341 Union Turnpike, Hudson, N. Y.

THE V & O PRESS COMPANY
Division of Emhart Mfg. Co.
BUILDERS OF PRECISION POWER PRESSES AND FEEDS SINCE 1889
HUDSON NEW YORK

2 FOR 1



RIVETT 1020S

HAS WHAT IT TAKES TO MAKE AN OUTSTANDING LATHE

★ 40% heavier than comparable lathes. Weighs 3900 lbs. ★ Back gearing for power cuts—belt drive free of all gearing for high speeds. Range from 22 to 3600 R.P.M. ★ 12¾" wide hardened steel ways of bed absorb heavy cutting force. ★ Infinite spindle speeds through trouble-free mechanical drive. ★ Push button controls for complete operation. ★ Neutral clutch stops spindle without stopping drive. ★ Three bearing mounts for spindle. ★ Collets mount directly in spindle. ★ Hand wheel for turning headstock spindle ★ Anti-friction bearings used throughout. ★ Gear box gives 72 feeds and 84 threads from 2 to 240 per inch. ★ Automatic lubrication. ★ Hardened and ground feed screws.

RIVETT 1020S is an Instrument Lathe and an Engine Lathe

A double-duty machine—combining the feather-touch sensitivity of an instrument lathe with that heavy-biting ruggedness which carbide cutting tools require. This powerful geared-head lathe qualifies for any turning within its 12½" swing and 20" centers.

Bulletin 1020A has proof of how outstanding this Rivett would be in your shop. Write for copy today.

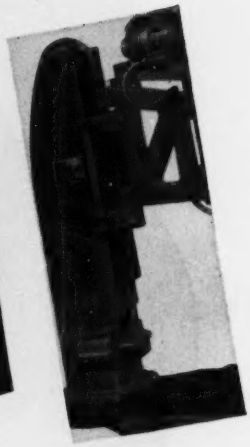
RIVETT LATHE & GRINDER, Inc.

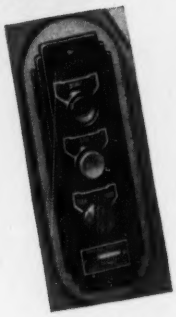
Dept. MR-4 Brighton 35, Boston, Massachusetts

You can use other lathes . . . or employ other types of metalworking machines . . . but on no other tool can you get so much production with such fine precision as on a Rivett.

FOOTBURT

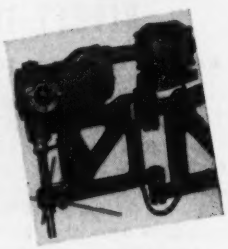
machine tools
for *increased*
production

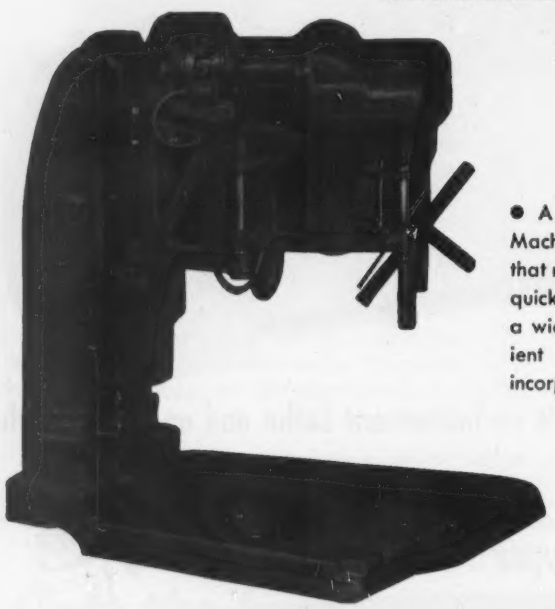




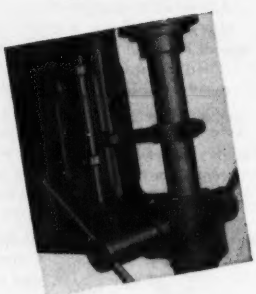
● Here is a machine designed to perform light drilling and tapping operations at high speed with minimum of effort. Any one of six spindle speeds may be quickly selected and tapping is always instantly available without any adjustments to the machine. It makes an excellent choice for miscellaneous work on a large layout of varying size holes.

THE FOOTE-BURT COMPANY, Cleveland 8, Ohio
Detroit Office: General Motors Building





● A Unique Radial Drilling Machine with Hinged Bracket that makes it possible to swing quickly from hole to hole over a wide area. A very convenient tapping arrangement is incorporated in this machine.



engineered for production

FOOTBURT

MACHINE TOOLS

Removal of Siliceous Volcanic Cinders — Redmond, Oregon

Caterpillar Tractor Co. Photo

The Invisible Background of Industrial Progress

In Redmond, Oregon, a siliceous volcanic mountain is being leveled by powerful Diesel bulldozers. The volcanic cinders derived from this opencut mining operation when mixed with asphalt or concrete produce an excellent non-skid surface for modern highways especially in mountainous country.

The use of Diesel powered bulldozers to push this material into piles for mechanical truck loading, depicts American initiative and the trend to utilize industrial machinery to the utmost.

The Bullard Company for over 70 years has progressively created and placed in practically all industries of the world, Machine Tools that have led the way to greater production. Machine Tools which have helped produce these laborsaving machines as well as the numerous industrial, consumer and luxury items that comprise our American standard of living.

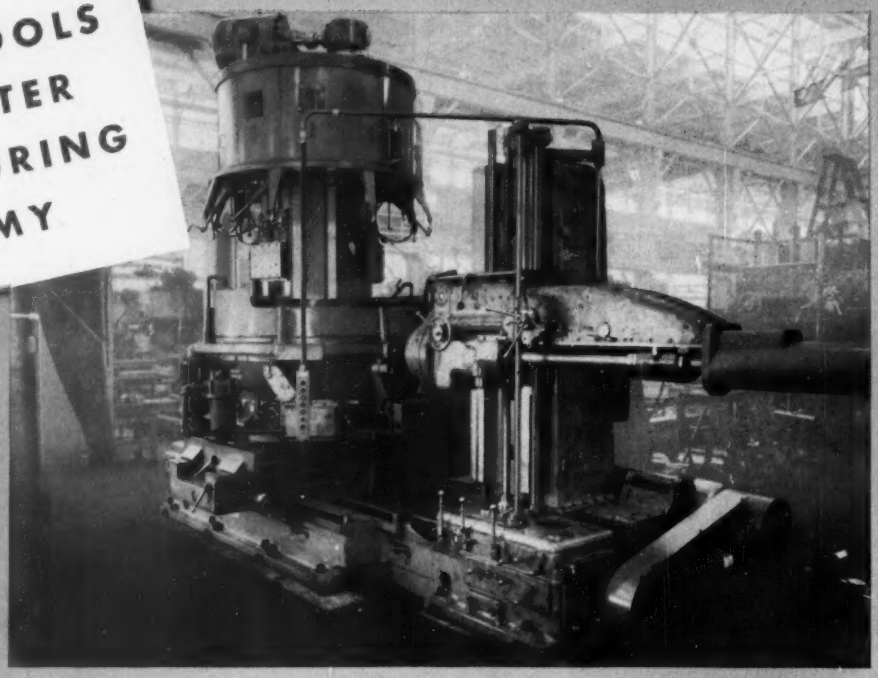
Bullard, through constant research and engineering, builds ★ *Modern Machine Tools* that are recognized for their accuracy, ruggedness, dependability, versatility and economy of operation. They are key production units for today's manufacturing plants.

★ *For greater manufacturing economy REFER to next page.*

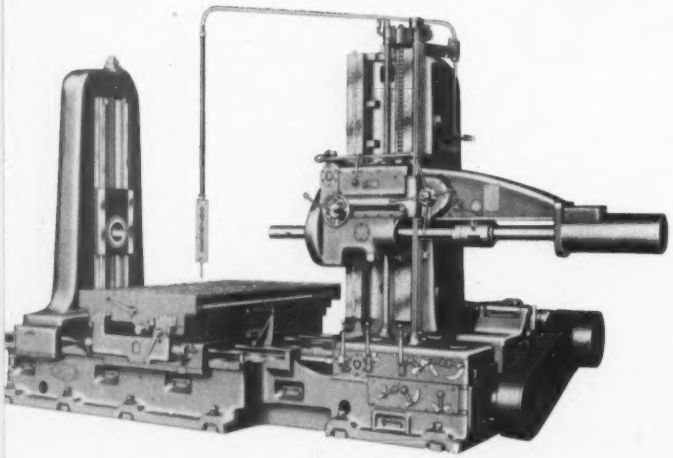
THE BULLARD COMPANY

BRIDGEPORT 2, CONNECTICUT

BULLARD MACHINE TOOLS FOR GREATER MANUFACTURING ECONOMY



This 18½-ton Mult-Au-Matic was used to test the load carrying capacities of the Bullard 4-Way Bed Horizontal Boring, Milling and Drilling Machine.



The Table and Saddle were moved in all directions under feed and power traverse with this unusual load. All movements were extremely smooth without any tendency toward sticking or overloading the main drive motor.

This is conclusive proof of the load carrying capacity and operating smoothness of the Bullard 4-Way Bed Horizontal Boring, Milling and Drilling Machine.

BULLARD

Complete information on request.

THE BULLARD COMPANY BRIDGEPORT 2, CONNECTICUT

Another TOCCO® First!

INDUCTION HARDENED CYLINDER BORES...

for much longer engine wear— at much lower cost

PROBLEM:

Cylinder liners cost a lot of money, and, of course, they take up space that could be used for generating extra horsepower.

As a result engine builders, hoping to abolish the need for liners, experimented with various hard alloy irons that can furnish desired hardness in the cylinder bores.

However, these hard castings were extremely difficult to machine, and they cost several dollars per casting extra.

SOLUTION:

Now TOCCO® has developed and patented a process for Induction-hardening the cylinder bores of conventional, cylinder-iron castings. The blocks are easy to machine, yet cylinder bores are very hard to a depth of about 1/16". This depth of hardness permits several re-honings with no loss of hardness in the cylinder bore.

The cost?—less than half the extra cost of alloy iron cylinder blocks.

This important development is typical of the way TOCCO works hand-in-glove with the Metal Working Industry to improve products and lower costs.

see our catalog in MACHINE TOOL CATALOGS or write for copy

THE OHIO CRANKSHAFT COMPANY

TOCCO

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NEW FREE BULLETIN

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Please send copy of "Typical Results of TOCCO Induction Hardening and Heat Treating"

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here's how leading tractor manufacturers solve it with NEEDLE BEARINGS

Many makers of farm tractors specify Torrington Needle Bearings because of their relatively low cost and their long maintenance-free operation under rugged conditions.

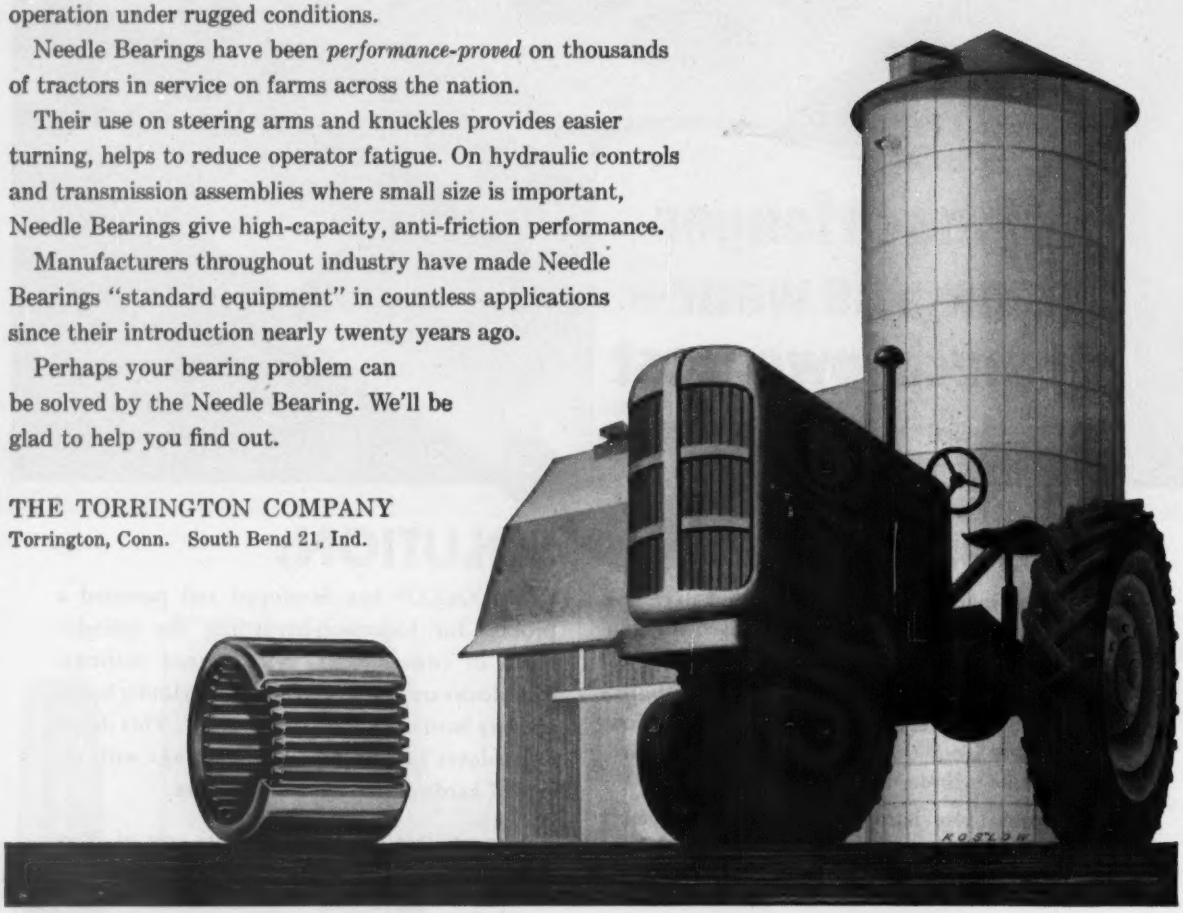
Needle Bearings have been *performance-proved* on thousands of tractors in service on farms across the nation.

Their use on steering arms and knuckles provides easier turning, helps to reduce operator fatigue. On hydraulic controls and transmission assemblies where small size is important, Needle Bearings give high-capacity, anti-friction performance.

Manufacturers throughout industry have made Needle Bearings "standard equipment" in countless applications since their introduction nearly twenty years ago.

Perhaps your bearing problem can be solved by the Needle Bearing. We'll be glad to help you find out.

THE TORRINGTON COMPANY
Torrington, Conn. South Bend 21, Ind.



TORRINGTON *NEEDLE* **BEARINGS**

Needle • Spherical Roller • Tapered Roller • Straight Roller • Ball • Needle Rollers

Trade-marks of some of the manufacturers who use Needle Bearings

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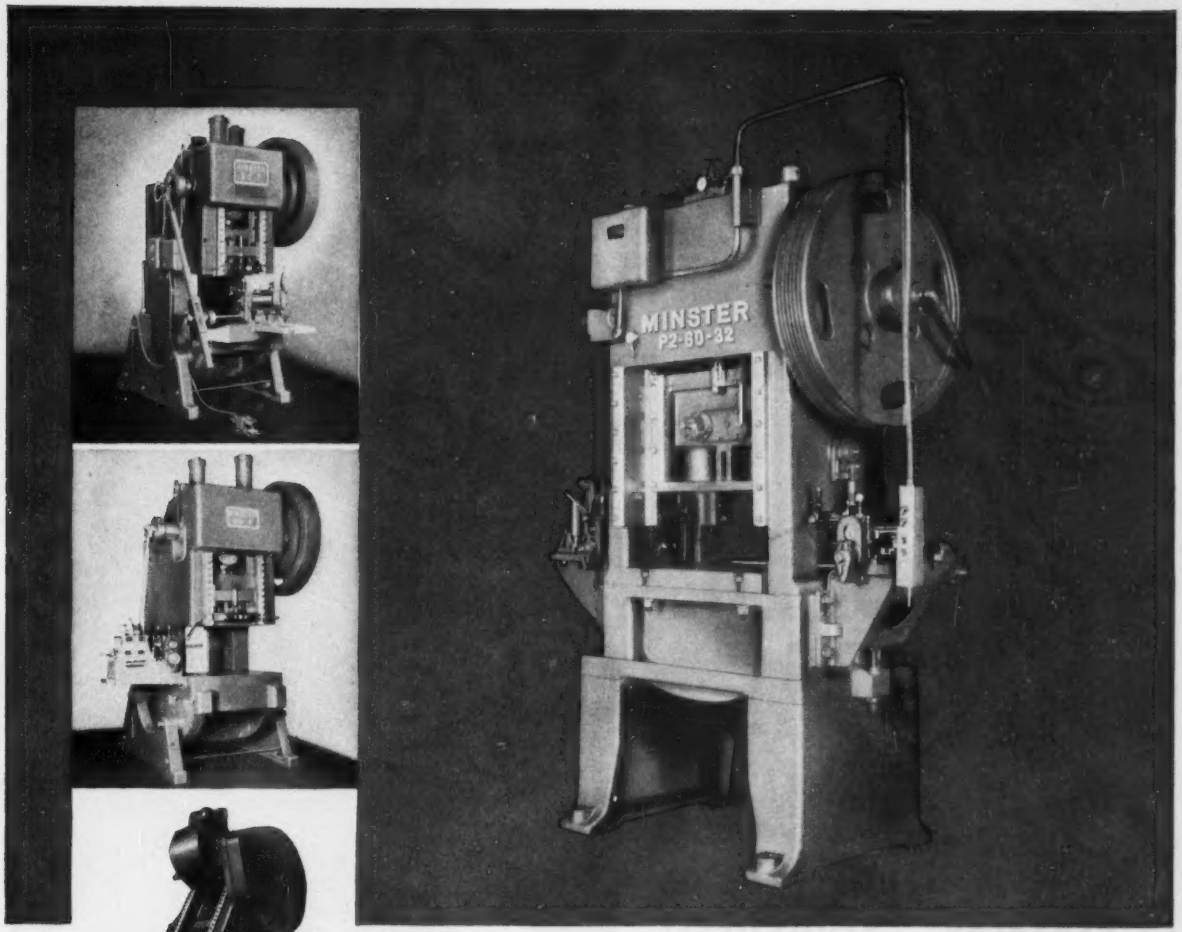

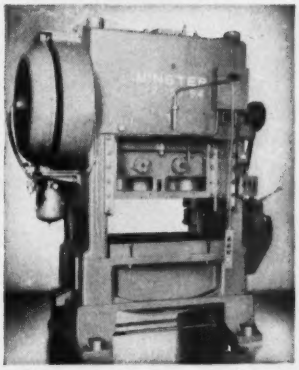

FEED IT AUTOMATICALLY WITH A

MINSTER

Take a long, close look at automatic press feeding. Here may be the answer to (1) needed production increases, (2) more efficient plant layout, and (3) easing of manpower problems.

Single roll feeds, double roll feeds, stock straighteners, oilers, scrap cutters, coil reels . . . all types of feeds and auxiliary equipment can be furnished on the many types of Minster presses.

Even more important, Minster presses are built with the extra rigidity and accuracy so necessary for automatic production of high accuracy parts. Minster's P2 *Piece-Maker Presses,* in particular, offer a standard of press alignment accuracy never before achieved. Intricate stampings with finest progressive dies are now a production reality.

Get the facts. Send part samples and die drawings for our press and feed recommendations.

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THE MINSTER MACHINE CO., MINSTER, OHIO

FOR TURNING • FACING • THREADING • BORING

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STANDARD TOOLS

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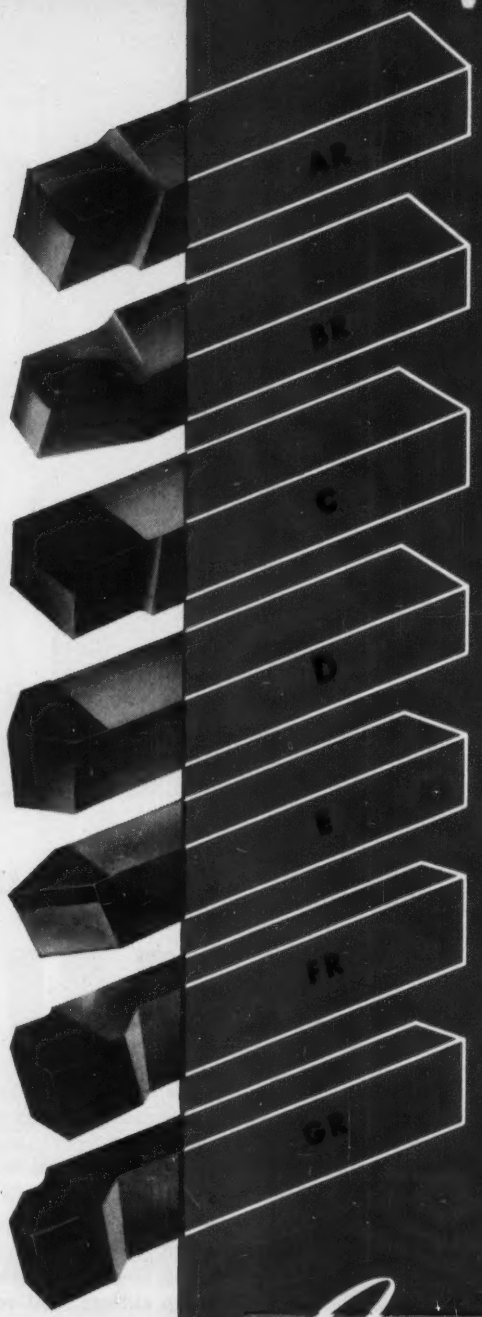
WITH
CARBOLOY - - KENNAMETAL
and available with other leading carbides



Get the benefit of Super's tool making skill and still use the carbide you like.

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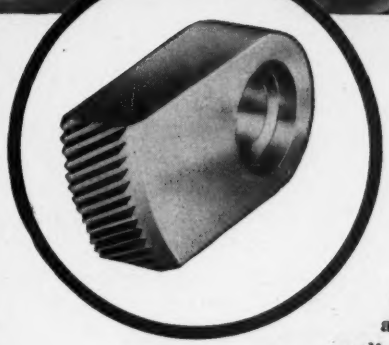
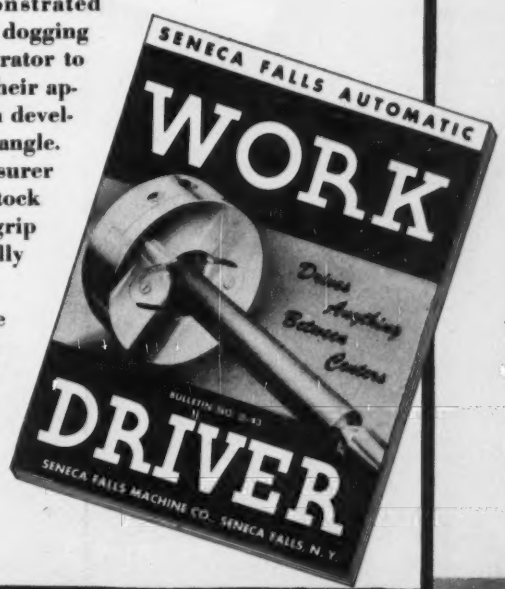
Automatic
WORK DRIVER
Drives Anything Between Centers



Jaws with angular serrations ... NOW STANDARD

● These self-centering, quick-acting Drivers have long demonstrated their ability to eliminate dogging time and to enable one operator to attend multiple machines. Their application has been widened with development of a new jaw having serrations milled at a suitable angle. These angular serrations provide an overlapping contact for surer and quicker grip on smooth finished, as well as hot rolled stock and forgings having a relatively hard surface. This positive grip eliminates slippage and resultant tool breakage . . . especially important when costly carbide tools are used.

Seneca Falls Work Drivers are designed for use on any engine or multiple-tool lathe and for certain work on turret lathes and grinding machines. In addition to time-saving, the Seneca Falls Automatic Work Driver provides greater safety for the operator since there are no projecting screws or sharp corners to catch clothing or injure hands. Made in 18 standardized models for work diameters ranging from ¼ to 6⅞ inches. Write for Bulletin D-43.



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WHAT *Life-Line* REALLY DELIVERS
IS MORE SERVICE . . . LESS SERVICING

Life-Lines are pre-lubricated . . . need no further lubrication. Write for "Facts on Pre-lubricated Bearings" B-4378. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

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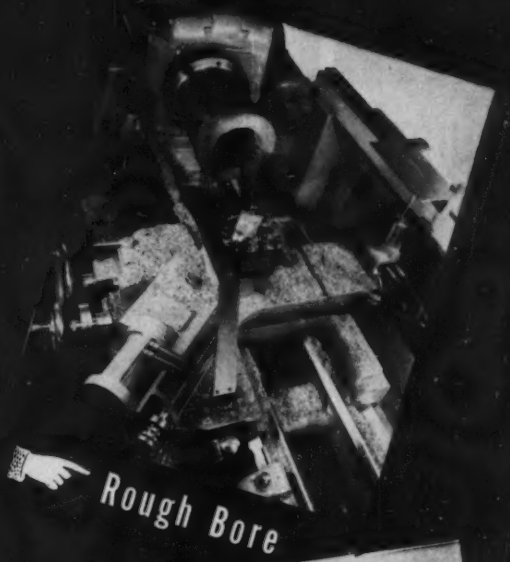
YOU CAN BE **SURE**...IF IT'S

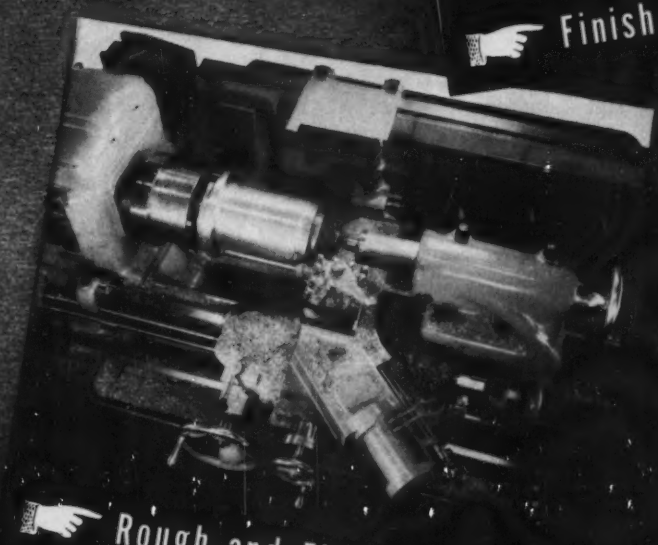
Westinghouse

a fraction of their former cost!



Rough Bore

Finish Bore



Rough and Finish Turn

Applicating Lathe operation!

The technique and production time used in this test were taken from actual performance in two of the nation's leading railroad shops.

A complete time study including all pertinent data is available upon request.

This is only one of the Diesel engine component jobs that "American" Hydraulic Duplicating Lathes are performing at record low cost in many of our leading railroad shops. Never has the need for economies in railroad operation been more urgent. Never has there been a better opportunity for effecting economies in the railroad shop than offered by the "American" Hydraulic Duplicating Lathe.

THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

blanking and embossing

ACOUSTIMETAL PANELS

4800 panels for 12" x 24" sound-deadening cells are blanked out and embossed per 8-hour day with these dies.

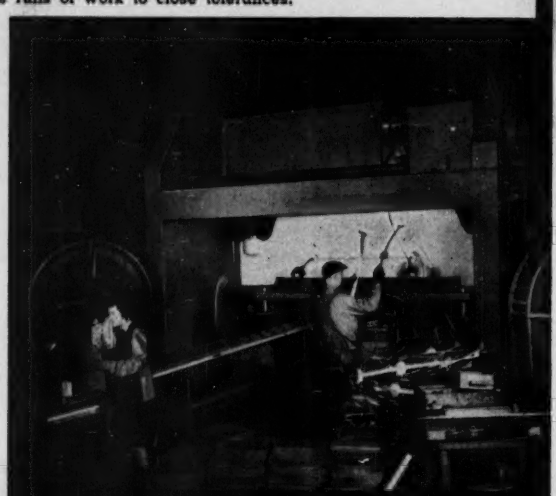
This rugged smooth-working press performs nearly every kind of metal forming operation at Dussing & Hunt, Inc.—bending, forming, flanging, blanking, embossing, and punching. It is easy to change the dies from one job to another or repeat previous runs of work to close tolerances.

Of the many types of work performed on the Model J4½-10 Steelweld Press at Dussing & Hunt, Inc., Buffalo, N. Y., the blanking and embossing of panels for Acoustimetal sound-deadening cells is one of the most interesting.

Large sheets of 26 gauge perforated metal are fed into the dies attached to the bed and ram, by the man operator and his woman assistant. At each stroke of the ram three panels are blanked out and embossed. Six panels for 12" x 24" cells are made from each sheet. 100 sheets are passed through the press per hour. Thus, 600 panels are turned out per hour, or 4800 per eight-hour day.

A large variety of metal parts are produced on the Steelweld. Included are 22-gauge stainless steel tops for deep-freeze cabinets with neatly rounded flanges, fire-proof doors and all-steel industrial doors of 10 to 14 gauge, 14-gauge pressed steel frames, heavy steel channels and many other parts.

The press was installed in 1942 and has been kept going continuously. The Plant Manager of this rapid-growing concern says, "It has proved very satisfactory and efficient."



Acoustimetal panels are produced with such speed that one man is kept busy at the rear of the press removing the scrap and a woman is fully occupied stacking the panels as they roll down the conveyor from the press bed.

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CATALOG No. 2010 gives construction and engineering details. Profusely illustrated.

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BRAKING • FORMING • BLANKING • DRAWING • CORRUGATING • PUNCHING

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PEERLESS HIGH SPEED EXPANSION REAMERS

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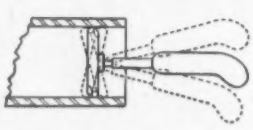
DuBo*

Plug Gages

Produce Superior Results

COLOR FLASH HANDLES
"GO" — GREEN
'NO GO" — Red

THE VALUE of a gage is "what it tells", "how well" and "how easily". If the job at hand calls for fixed limit gages, DuBo Plug Gages will give you the best value in dimensional control. DuBo tells MORE, MORE EASILY.



Operates by Tilting Handle

Whether handle will drop freely or not is the definite yes-or-no indication. No guesswork, no forcing, no fumbling!

MORE DEFINITE CHECK There is no uncertainty with DuBo as with the cylindrical type gage, whether the hole is smaller than the plug, or larger and merely close. DuBo not only checks dimensional accuracy but also reveals taper and out-of-roundness. DuBo reduces the number of parts needlessly rejected or improperly passed.

EASIER OPERATION The DuBo Plug Gage weighs from 70 to 80% less than cylindrical plug gages of the same dimension. It is self-piloting, no trouble at all to enter. A "feather touch" is all that is needed for operation. See diagram at left.

LONGER LIFE Gaging surfaces of the DuBo contact the bore walls only at the instant of making the check. DuBo gives you effective, economical gaging.

Double end DuBo Plug Gages Under 1.510"

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"In order to preserve and increase the economic industrial strength of our nation, a sound formula for replacing capital equipment is most necessary for *individual corporations.* We have used for the past few years at the Sundstrand Machine Tool Co. the MAPI formula as a guide to our needs and to ultimate purchase of new capital equipment. As we have several plants that compete for the funds available for capital purchases, it is important that we replace our old equipment in the most profitable manner. Using the MAPI formula as a guide helps our replacement committee to systematically determine which order of replacement should be undertaken . . . which purchase will give us the most return on our invested dollar."

BRUCE F. OLSON, *President*
SUNDSTRAND MACHINE
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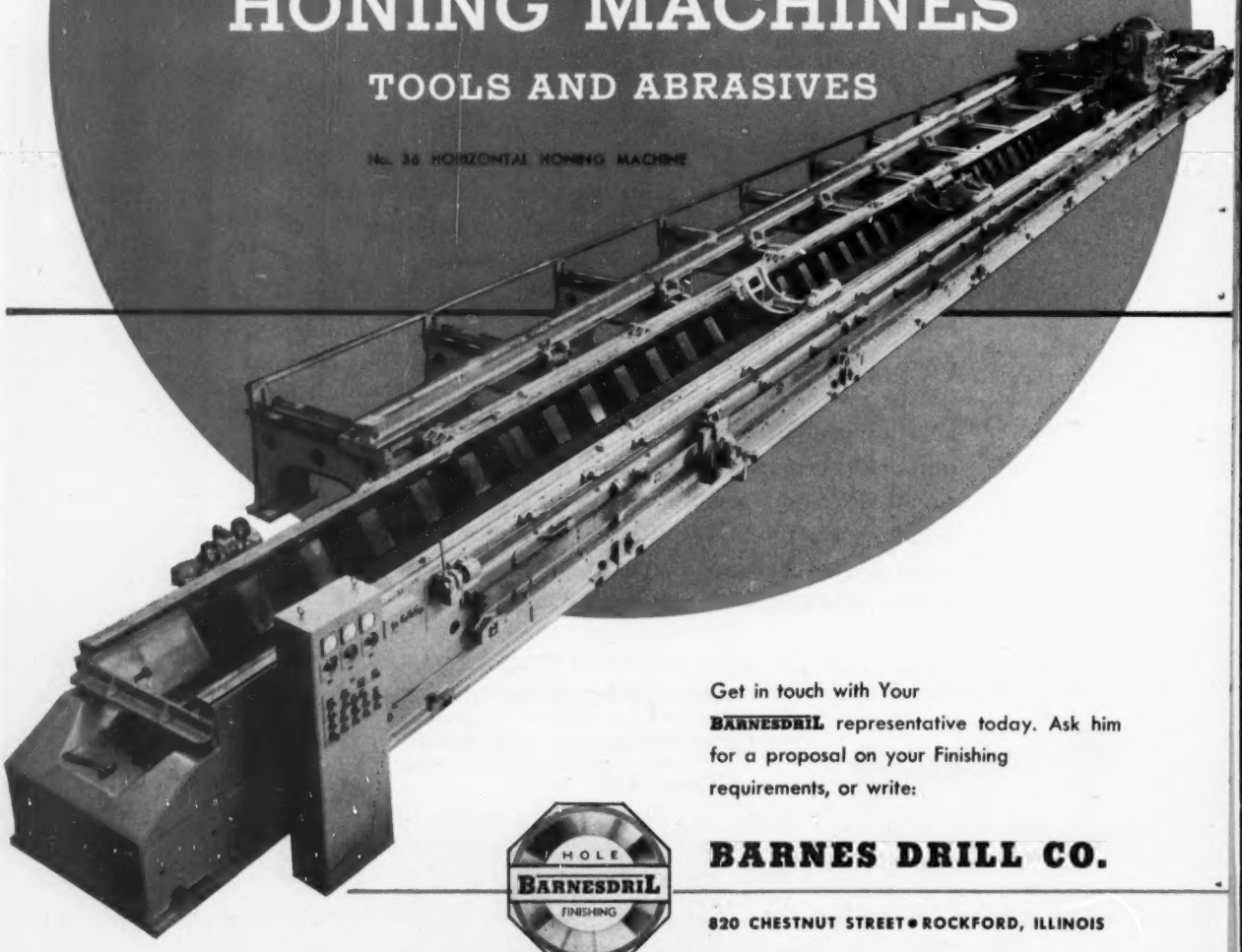

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Machinery, April 1953

HIGH PRODUCTION

BARNESDRIL Honing supplies speed, accuracy and economy for identical sizing and finishing of parts on a production basis. Large amounts of stock, consistent with production rates desired, are removed in addition to finishing to a high degree of accuracy and surface quality. Production is obtained from highly efficient automatic cycling.

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With consistently high rates of production, surface finishing is selective from 4-60 microinches, as desired. Size is held within "tenths" on straightness, roundness and parallelism. Surfaces are truly round, straight from end to end, and without bell-mouth or taper.

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BARNESDRIL tool design and development has produced Automatic bore-to-bore sizing, the most accurate sizing method yet introduced. The sizing operation is now simplified and removed entirely from the effects of cut-and-try methods, uneven stone wear, and variations in finish from bore to bore.

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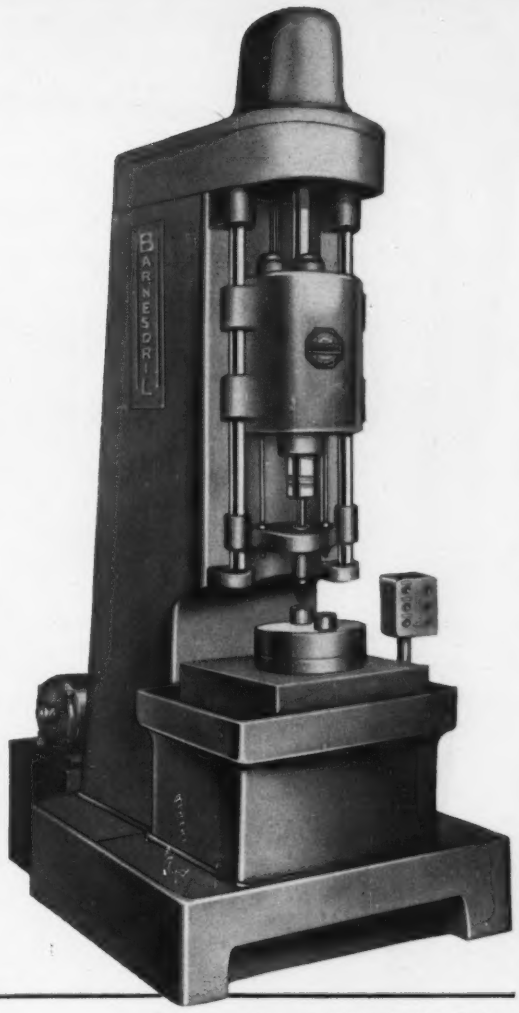
BARNESDRIL Engineers offer complete service on any problems related to Honed Surfaces. With background ranging from the development of the first production Honing Machine to automatic size control, they can assist you on machines, tools, abrasive stones or engineering.



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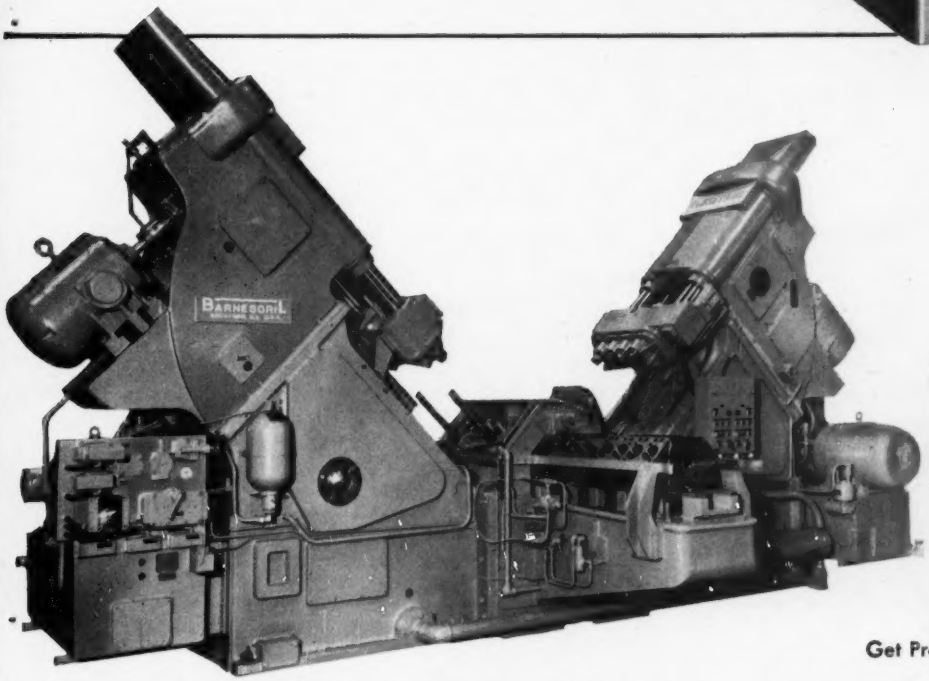
VERTICAL HONING MACHINE



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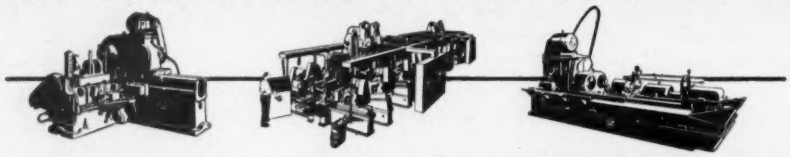

● One of the best equipped plants in the Midwest, W. F. & John Barnes is geared to provide an unusually broad machine tool building service. Machining, fabricating, and assembly departments for tools, gauges, fixtures, hydraulic, electrical, and conveyor equipment are centralized, and work is coordinated in one plant with planning, designing, and engineering. With these complete facilities, Barnes is in position to help you solve problems quickly and efficiently. The complete, coordinated service with undivided responsibility includes:

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- **SPECIAL HYDRAULIC EQUIPMENT** — designed and built to meet JIC standards. Individually engineered units assure smooth, dependable actuation for every requirement.
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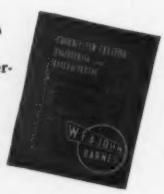
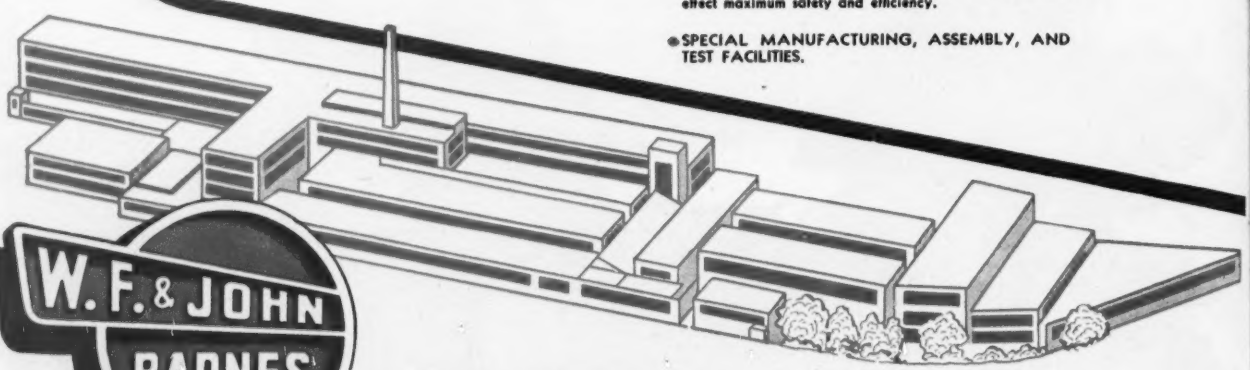
Ask for free booklet "Coordinated Machine Engineering" describing the scope of Barnes machine tool building service. Illustrates and describes modern machines and mass production techniques.





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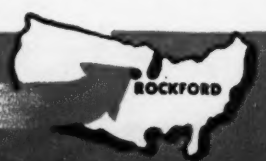
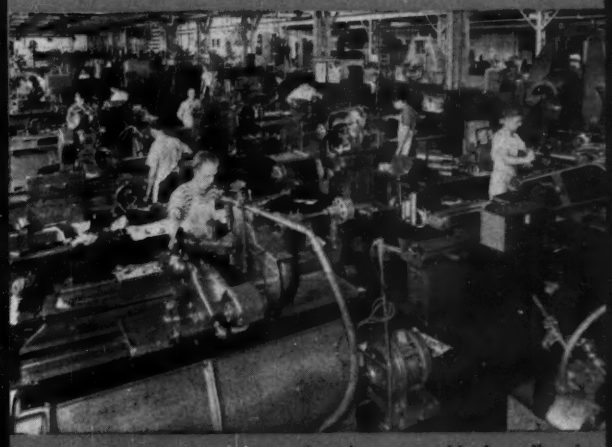


Open-Side Planers — speed rough and finish cuts at Barnes on a variety of long, narrow bed and head castings.

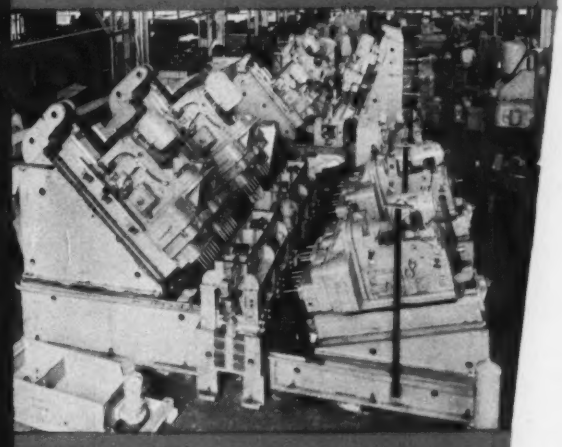
Large Double-Housing Planers and Mills — provide capacity at Barnes for efficient machining of extra-heavy bed and way castings up to 35 feet in length.



Precision Grinders — A wide variety of both small and large machines help Barnes speed small lot work requiring fine finished surfaces.

Modern Boring Machines — accurately bore bearing races in heads and fixtures — make true-running spindles in Barnes machines.

Head and Fixture Assembly — spindles, gears, bearings, and fixtures are assembled and tested by experienced mechanics.



Final Assembly — partial view of large L-shaped assembly bay where machines are assembled and test run prior to shipment.

W. F. & JOHN BARNES COMPANY 310 S. Water St. Rockford, Illinois

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YOU'LL FIND YOUR PRODUCTION MACHINE TOOLS IN...**ROCKFORD**

ILLINOIS, U.S.A.

* Check List for PRACTICAL LATHE TURNING

* BIG ACCURATE LEAD SCREW
INDEPENDENT FEED SHAFT
BIG PRECISION TIMKEN BEARING SPINDLE
HEAVY TAIL STOCK, ANTI-FRICTION THRUST BEARINGS
PRECISION HOBBED AND SHAVED HEADSTOCK GEARS
TOOL ROOM ACCURACY, ZERO PRECISION BEARINGS, PRODUCTION POWER, 5 H.P. DRIVE MOTOR
ALL GEARED HEAD, QUAD-V-BELT DRIVE
HEAVY CUTS, 16" OR 18" SWING, 30" CENTER DISTANCE
6' BED, DOUBLE-WALL APRON, 3100 LBS. TOTAL WEIGHT

either tool room or high production

Rockford Lathes offer you all of these production features, with modern design, ample dimensions and high quality materials.

Ask a Rockford Machine Tool Co. Representative to give you full details on the practical production advantages of these heavy service, medium sized, economy priced machines.

MEDIUM-SIZED
ECONOMY-PRICED

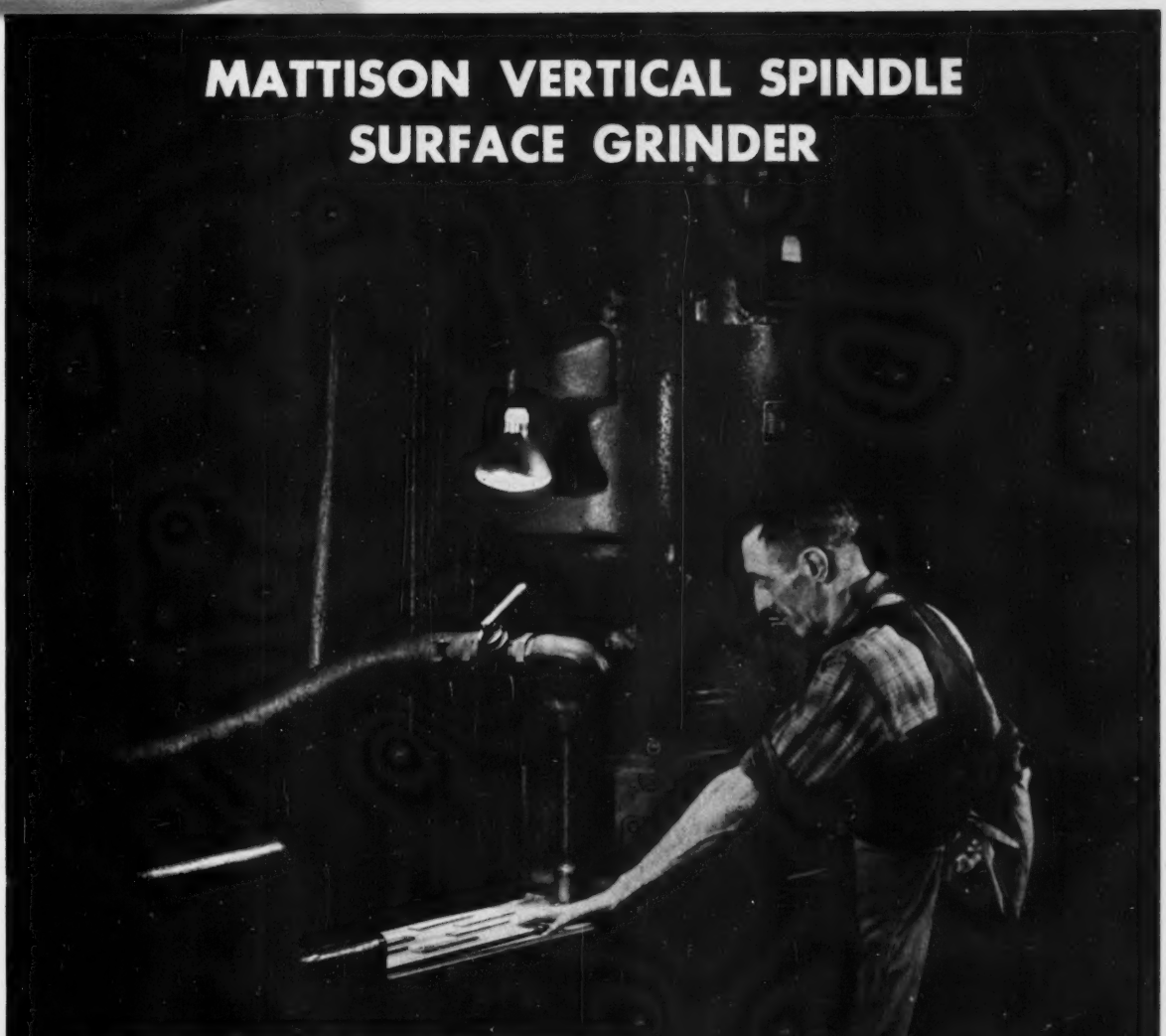
531

ROCKFORD ECONOMY LATHES—16" and 18"

ROCKFORD MACHINE TOOL CO.
2500 KISHWAUKEE STREET • ROCKFORD, ILLINOIS

MADE IN
ROCKFORD...MACHINE TOOL SHOPPING CENTER
ILLINOIS, U.S.A.

MATTISON VERTICAL SPINDLE SURFACE GRINDER



● This Mattison Vertical Spindle Surface Grinder is being used by Vascoloy-Ramet Corporation, for finishing cutting tool bits made of Tantung, a hard, tough alloy composed principally of cobalt, tungsten, chromium and tantalum-columbium carbide. Because of the rugged construction, ample power and capability for fast stock removal, this Mattison Grinder enables Vascoloy-Ramet to economically grind their tool bits on a real production basis.

The Mattison Vertical Spindle Surface Grinder is built in several sizes for varying requirements. Mattison also manufactures all types of Surface, Face and Disc Grinders. For information covering the Vertical Spindle Grinder shown above as well as our complete line, write for a free copy of our general catalog No. 1901RM.

MATTISON MACHINE WORKS

ROCKFORD • ILLINOIS

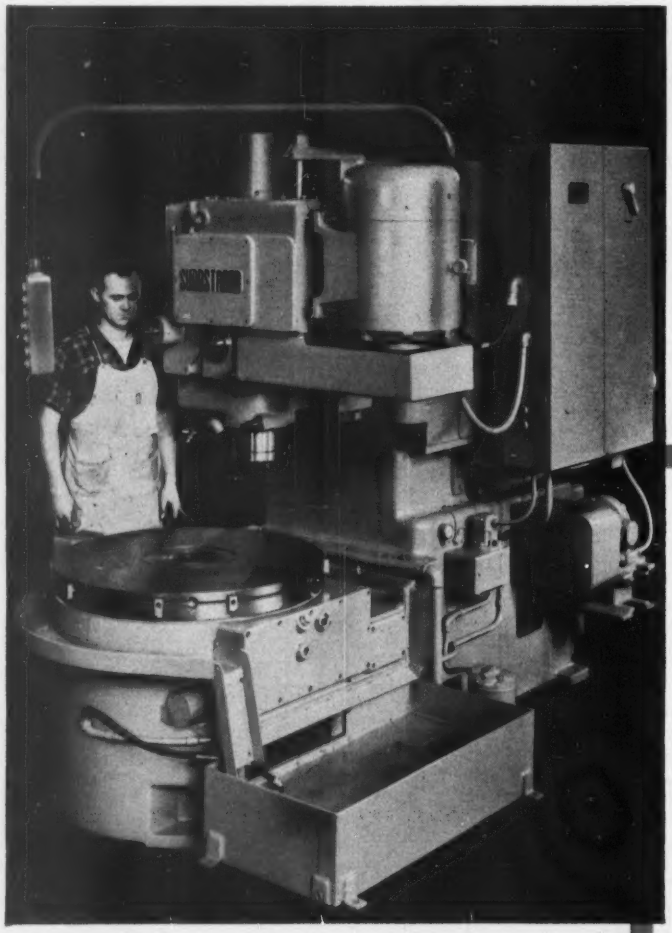
MADE IN

ROCKFORD MADE MEANS PRECISION MADE...**ROCKFORD**

ILLINOIS, U.S.A.

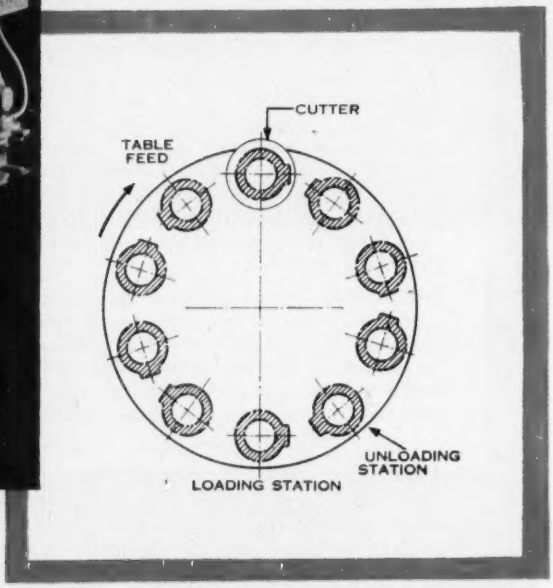
Check These Time Saving Possibilities of SUNDSTRAND Rotary Milling Machines

Sundstrand standard vertical rotary Rigidmil milling machines have many possibilities for solving production milling problems. They can be furnished with one or multiple spindles. In all cases loading and unloading time is eliminated. Check into the possible application of a Rotary Rigidmil to your production milling. A Sundstrand engineer will be glad to help. There is no obligation for this service.



Single Spindle Applications

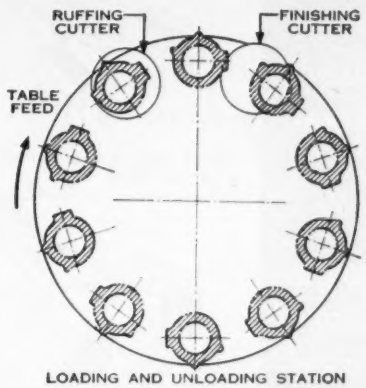
Photo and drawing to the left illustrate the design and operation of the single spindle machine. It is made in two sizes, 36″ or 48″ diameter rotary table. It has a 25 hp vertical head and can be furnished with either power or manual feed for cross positioning of the head carrier. Head is mounted on vertical ways for manual positioning. Machine can be provided with power elevating device for positioning of head or for automatic cutter retraction.



SUNDSTRAND

RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT

MADE IN ROCKFORD...A CONVENIENT SOURCE FOR PRODUCTION NEEDS
ILLINOIS, U.S.A.

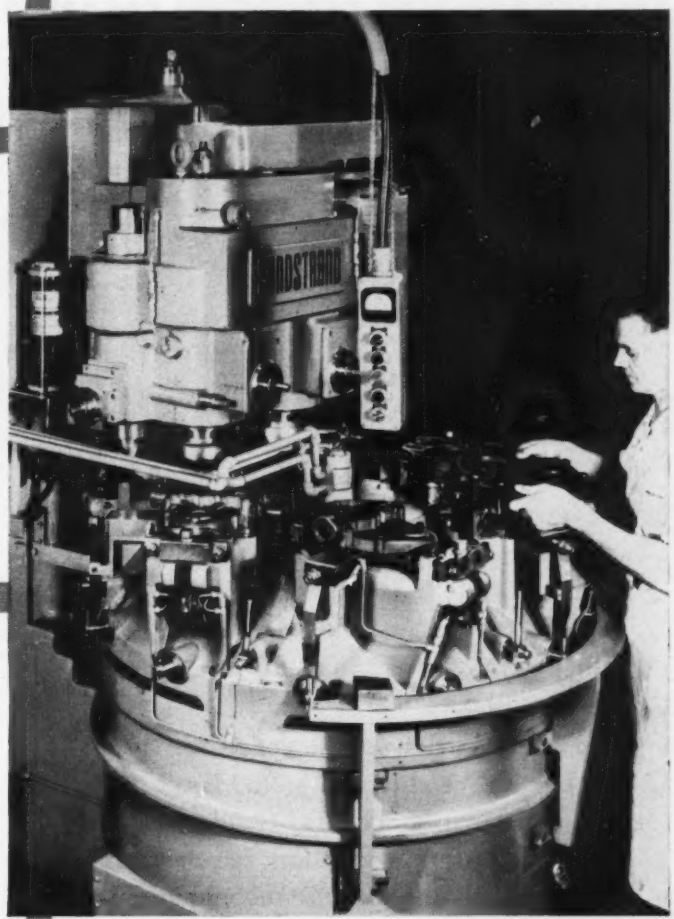


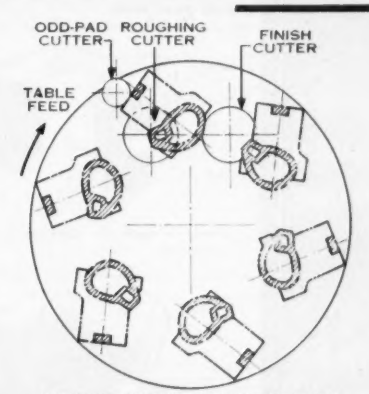
Two Spindle Applications

Basically the two spindle machine is the same as the single spindle rotary Rigidmil. The drawing to the left indicates how both rough and finish milling cuts can be made simultaneously. As in the case of all rotary Rigidmils, loading and unloading time is eliminated—operator loads and unloads while cuts are in progress.

Multiple Spindle Applications

Photo to the right illustrates a special tooling job on a 3 spindle rotary Rigidmil. In this installation, one cutter ruff mills the large pad, a second cutter finish mills this same pad, and the third cutter takes one cut on a small pad at a different depth — all with one clamping of the part. As in the other applications, operator merely loads and unloads the workpiece. Machines with four or more spindles can be supplied to meet the requirements of the job.





FREE DATA is available on Sundstrand Rotary Rigidmils or other time saving Sundstrand milling machines. Ask for bulletin 630.

SUNDSTRAND

SUNDSTRAND
Machine Tool Company
2530 Eleventh St. Rockford, Ill., U.S.A.

DRILLING AND CENTERING MACHINES • SPECIAL MILLING AND TURNING MACHINES

MADE IN
CENTER OF MACHINE TOOL EXCELLENCE...ROCKFORD
ILLINOIS, U.S.A.

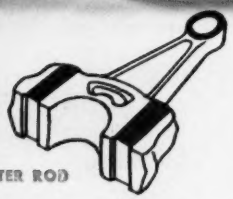
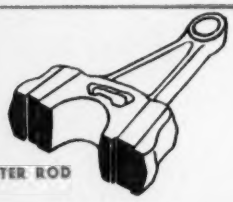
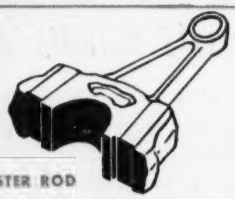
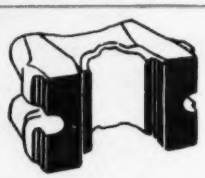
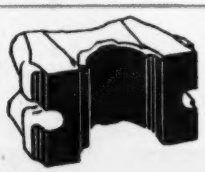
AIRCRAFT MASTER ROD and CAP

broached in high production sequence

the *American* way

To simplify a metal removing problem on master rods and caps for aircraft reciprocating engines, six American dual ram broaching machines are used in high production sequence. These broaching machines rough and finish broach the surfaces, as illustrated.

This time and cost saving sequence is typical of the production methods possible with American machines. Send us a part print and your production requirements. American engineers will recommend the right machine and tooling, whenever broaching is the answer to your needs. *For additional data on the American SBD-72-30 write for circular No. 300.*

SBD-66-25 BROACHING MACHINE	 MASTER ROD	*Broach sides of main bearing and piston pin boss.*
SBD-72-30 BROACHING MACHINE	 MASTER ROD	*Semi-finish cap seat surface and inside chamfers at bottom of seat.*
SBD-72-30 BROACHING MACHINE	 MASTER ROD	*Rough and semi-finish broach main bearing bore and finish broach chamfers and relief grooves.*
SBD-66-25 BROACHING MACHINE	CAP	*Straddle broach sides and broach bolt head seats.*
SBD-66-25 BROACHING MACHINE	 CAP	*Rough broach cap tongues and chamfers.*
SBD-72-30 BROACHING MACHINE	 CAP	*Semi-finish broach main bearing bore and finish cap tongue and chamfers*

AMERICAN *American* BROACH & MACHINE CO.

A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

American Building - Ann Arbor, Michigan

SUNDSTRAND

See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

MADE IN

ROCKFORD...CITY OF MACHINE TOOL SPECIALISTS

ILLINOIS, U.S.A.

IPSEN INDUSTRIES, INC.

717 SOUTH MAIN ST., ROCKFORD, ILLINOIS

To: PLANT MANAGERS AND METALLURGISTS

Subject: New Heat Treating Research Service

Gentlemen:

How much do your heat treating operations cost?

In view of recent developments, have you considered all cost items bearing on the heat treatment of your metal parts such as unnecessary cleaning, grinding, distortion, quality, and work handling?

If you believe some of your present methods should be analyzed, may I suggest that you take advantage of our free metallurgical and heat treating research services.

We are fully-staffed and equipped to study your problems and help you develop better cost-cutting methods.

If you desire, we will run sample or production lots of your work in our automatic controlled atmosphere units, establish proper procedures, and provide you with complete cost estimates without charge or obligation.

I suggest you write or call for further details, or when convenient, stop in and see our new, modern laboratory and equipment at work.

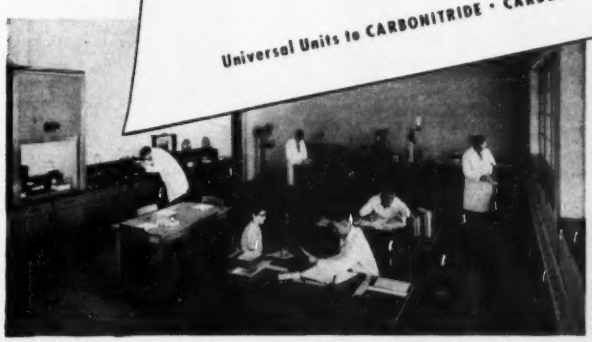
Sincerely yours,

H. N. Ipsen

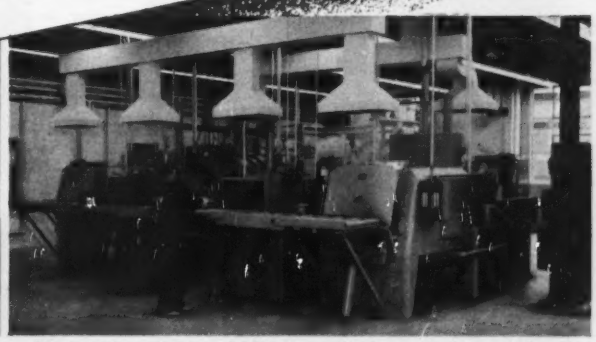
President

HNIpsen:bt

Universal Units to CARBONITRIDE · CARBURIZE · HARDEN · BRAZE · MARTEMPER · WASH · TEMPER



Skilled Ipsen metallurgists work with instruments of latest design, including induction carbon apparatus, Tukon hardness tester, microscopic equipment and special pyrometric apparatus.



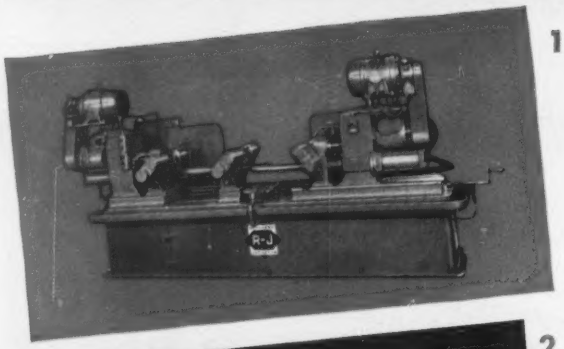
Shop section of Ipsen Laboratory showing a portion of heat treating equipment which includes 250 and 400 lb./hr. automatic controlled atmosphere furnaces, washers, and tempering units.

MADE IN

YOU'LL FIND YOUR PRODUCTION MACHINE TOOLS IN... ROCKFORD

ILLINOIS, U.S.A.

Rehnberg-Jacobson



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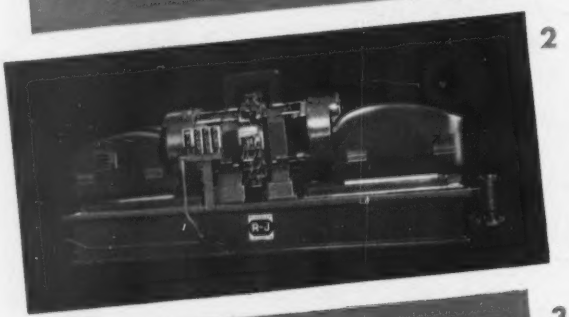

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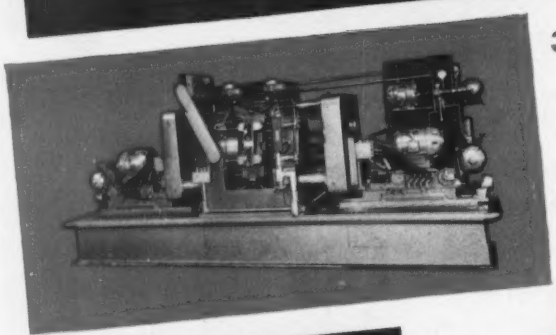

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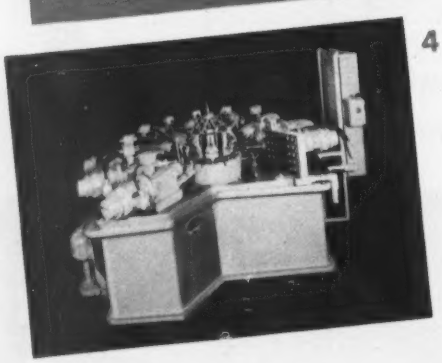

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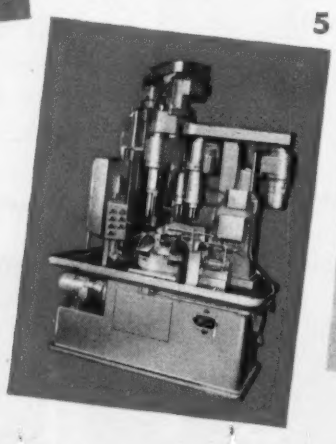

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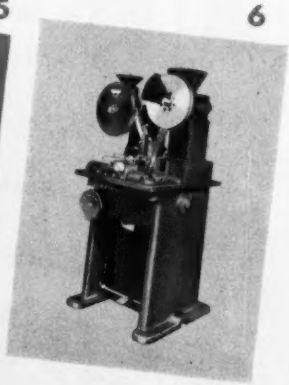


6

MACHINES FOR PRODUCING

UNIVERSAL JOINTS *and* TORQUE TUBES

These pictures show only a few of the numerous machines we have designed and built for this purpose. If you have production problems on parts for universal joints or torque tubes, or anything similar, be sure to give us a call — our knowledge could prove very valuable to you. We claim to be the most experienced builder in the country of machines for this purpose.

1 Double-end machine bores, chamfers, and bevels both ends of torque tubes of various lengths. Rated 200 per hour.

2 Double-end machine with 6-position trunnion fixture drills, reams, and faces cross holes in slip yokes and weld yokes. Rated 300 per hour.

3 Double-end machine with 4-position trunnion fixture on R-J Index Unit drills lubricating holes in four journals of universal joint crosses. Rated 600 per hour.

4 Seven-position index machine drills, countersinks, and taps grease fitting holes in crosses. Two pieces per position. Rating 600 per hour.

5 Four-position vertical machine drills, countersinks, and taps mounting screw holes in wing-type bearing retainers. Rated 400 per hour.

6 Needle bearing assembly machine automatically puts rollers in bearing race, presses on retainer, and greases bearing. Rated 800 per hour.

REHNBERG-JACOBSON MFG. COMPANY

DESIGNERS & BUILDERS OF SPECIAL MACHINERY

R-J

2135 KISHWAUKEE ST.
ROCKFORD, ILLINOIS

MADE IN
ROCKFORD...FOR MACHINES DESIGNED TO SUIT YOUR PRODUCTION
ILLINOIS, U.S.A.

GREENLEE *Automatics*

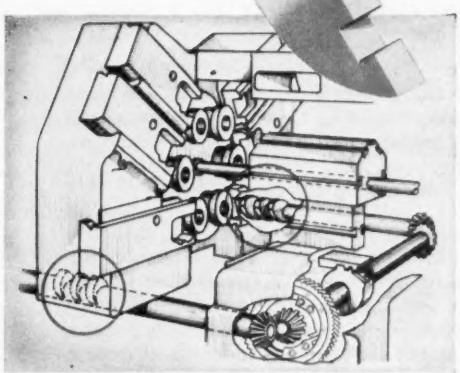
INTERCHANGEABLE CROSS-SLIDE CAMS

On Greenlee Automatics, cross-slide cams are fully interchangeable—any cam can be used to move any cross-slide. Drive for the cams is arranged in such a way that the cross-slide travel is in a selected ratio to the travel of the main slide. Standard cams are available to provide a wide range of ratios.

In the average job shop, a set of only 15 standard cams will provide enough flexibility to take care of 90% of the jobs that will come through. Standard ratios range from 1½:1 to 8:1.

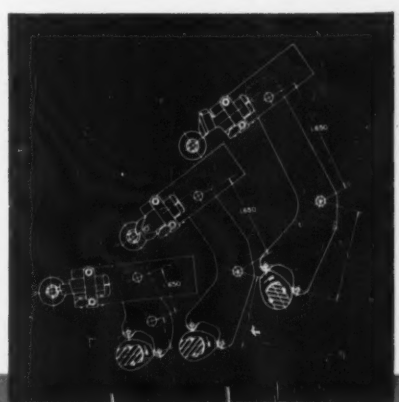
Simplicity of Design Promotes Production Efficiency

The distinctive Greenlee cross-slide cam design and operating features promote production efficiency on many short-run jobs because they reduce changeover time. In addition, there is an economy of investment.



As shown at the left, cross-slide cams are located at the sides of the machine, under the open ends of the cross-slide housings, where they are easily accessible.

As shown at the right, each cross-slide is operated independently by a separate cam, making it easier to split up operations and arrange better tooling set-ups.



Write for FREE Literature

PRODUCTION MACHINERY

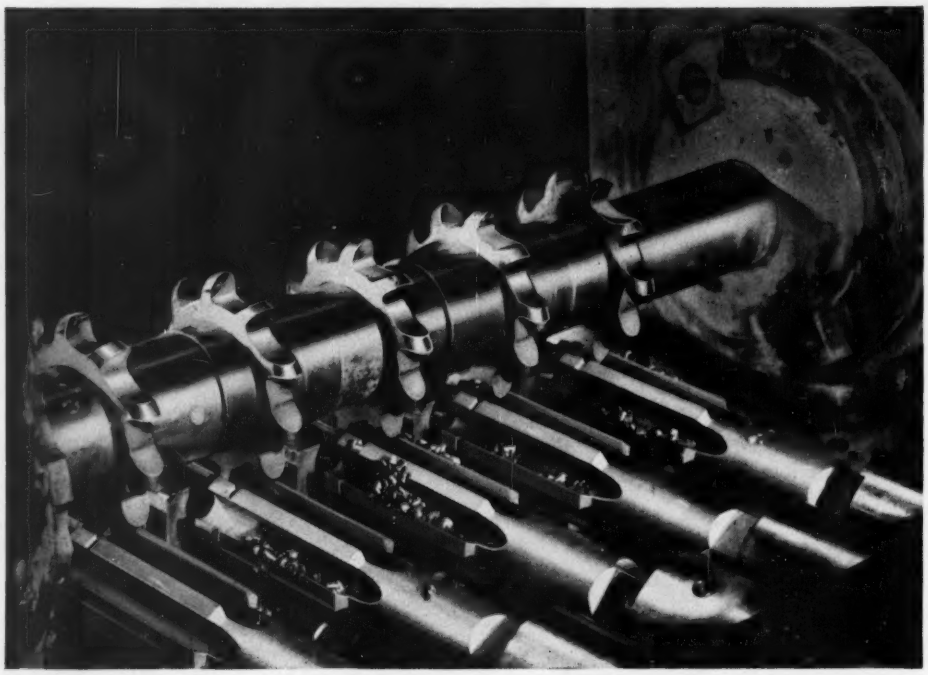
GREENLEE

GREENLEE BROS. & CO.
1864 MASON AVE., ROCKFORD, ILL.

1 Sectional view shows the sliding cam-carrier on shaft with cam and lock-pin removed.
2 Cam slips easily into place on shaft with slots in alignment with keyways.
3 The sliding carrier with keys attached quickly locks cam in position on shaft.

MADE IN
FOR PRODUCTION MACHINE TOOLS IT'S...ROCKFORD
ILLINOIS, U.S.A.

CUT FORM MILLING COSTS WITH



GET PEAK MILLING EFFICIENCY WITH SPECIAL FORM AND ACCURACY

Special milling problems become simplified when Barber-Colman Form-Relieved Milling Cutters are used on the job. Specialists in cutting-form development, Barber-Colman Cutter Engineers combine critical job features with maximum cutting efficiency in the cutter design.

Using special equipment and skills, forms are accurately developed and reproduced on cutter teeth to assure consistent duplication and accuracy in successive cuts. Cutters are projected 50 to 100 times size against engineering layouts to check exact tolerances. Accuracy of form is maintained the full length of the teeth and indexing of teeth is held to close tolerance, allowing the cutters to be sharpened accurately on automatic sharpening machines.

Many times, a series of cuts can be combined into a single combination-form cutter. As an example, several surfaces on these turbine blades are cut with a single cutter. The special cutter form controls accuracy, finish, and form automatically, making the job easier for the operator and reducing the cost per piece.

DESIGNERS OF STANDARD AND SPECIAL

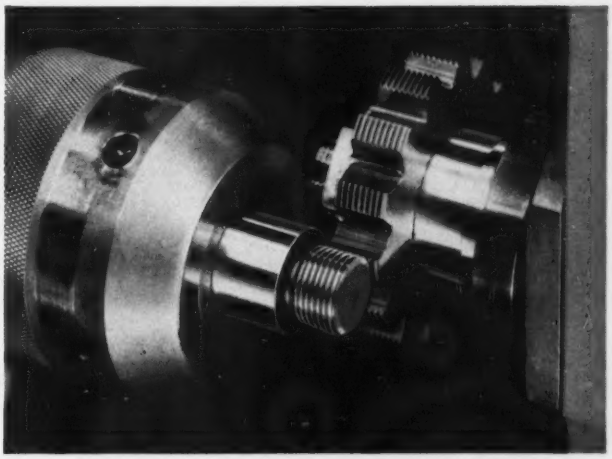
MADE IN

ROCKFORD...MACHINE TOOL PLANTS CLOSE TO YOUR PLANT

ILLINOIS, U.S.A.

Machinery, April, 1951

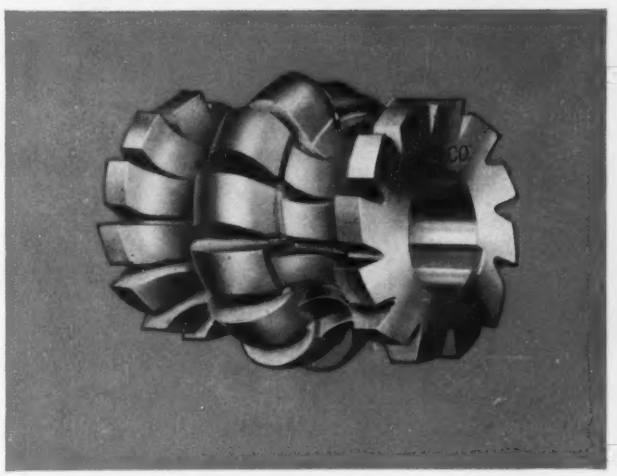
Barber-Colman FORMED CUTTERS



ACCURATE UNGROUND CUTTERS

New standards of production accuracy are available with unground form-relieved cutters because of special engineering techniques and heat treating methods. A change in tool design on this class 3 thread milling job, has cut tool costs and improved the set-up. Barber-Colman engineers designed unground shell type cutters with larger diameter and greater number of teeth to replace ground shank type cutters previously in use. The new design provides class 3 accuracy on ¾"-16 threads and improves the cutting action with a rigid, short-coupled drive.

These Barber-Colman ganged formed cutters hold exact form limits on contour of 3 lobe supercharger rotors, maintaining high production and tool life. Form on each lobe is held within .003" at a radius of 1.160". Production is 30 minutes floor-to-floor per rotor, 50 rotors per sharpening.



These typical jobs are evidence that special form-relieved cutters can aid you on many of your complicated milling problems. Cutter efficiency of this type is possible with tools engineered-for-the-job. Try Barber-Colman form-relieved cutters on your next production milling problem and experience the satisfaction of having fewer operations, simplified tooling, faster production and trouble-free machining. Send us blue-prints and sample parts for analysis and quotation.

HOBS • CUTTERS • REAMERS
HOBBING MACHINES
HOB SHARPENING MACHINES

BARBER COLMAN

Barber-Colman Company

GENERAL OFFICES AND PLANT, 824 ROCK STREET, ROCKFORD, ILLINOIS, U.S.A.

METAL CUTTING TOOLS SINCE 1908

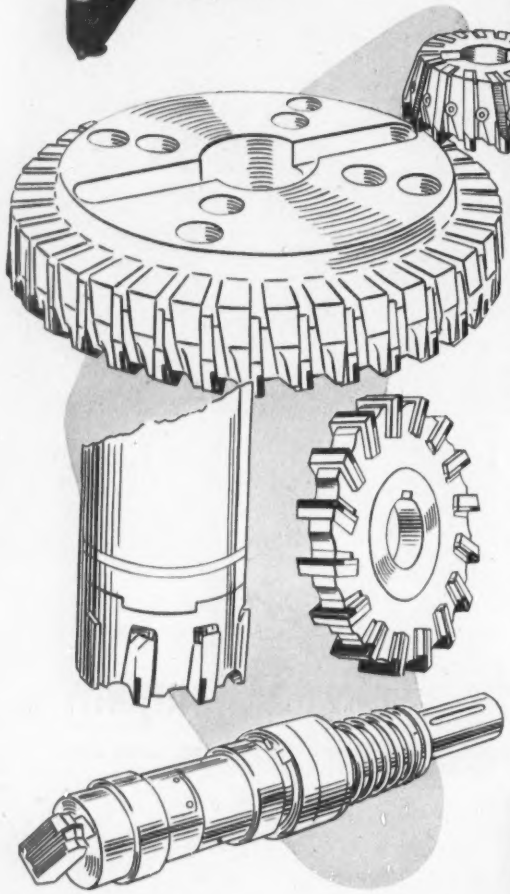
MADE IN

FOR METAL REMOVAL WITH ACCURACY AND SPEED...ROCKFORD ILLINOIS, U.S.A.

INGERSOLL'S NEWEST

58-Spindle Process Machine

MILLS AND BORES 90 AUTOMOBILE CYLINDER BLOCKS PER HOUR



Seven kinds of milling cutters, together with boring tools and chamfering bars, fixtures and transfer equipment, were built by Ingersoll as integral parts of the process line pictured above.

Working with our machine designers to meet exacting production and accuracy requirements of the automobile industry, Ingersoll's cutter engineers are continually improving basic tool designs.

Application of these advances to our standard inserted blade cutters makes higher feeds, longer tool life, and increased production available for all kinds of work on all makes of milling and boring equipment.

Write for
NEW INGERSOLL
Cutter Catalog 60D

THE INGERSOLL MILLING MACHINE CO., ROCKFORD, ILLINOIS, U. S. A.

MADE IN
ROCKFORD...A CONVENIENT SOURCE FOR PRODUCTION NEEDS
ILLINOIS, U.S.A.

Machinery, April, 1951

YES, IT IS POSSIBLE...
HIGH-STRENGTH GEAR BLANKS without EXCESSIVE WEIGHT

Whenever we ask a customer what he rates highest in a gear blank, he usually answers "Strength." Sometimes he'll add as an afterthought, "Strength, yes. And when I can get a heavy-duty blank without a lot of extra weight, so much the better. That's a real advantage."

Bethlehem is turning out that kind of gear blanks every working day of the year. Blanks for spur, bevel, miter, herringbone, and other types of gears. Strong, sturdy, durable blanks for gears that will carry the wickedest loads. Yet they are not encumbered with pounds and pounds of excess weight that can frequently cause some genuine problems for the machine-designer.

How is this possible?

One important factor is Bethlehem's unique manufacturing process. At Bethlehem, the blanks are forged and rolled, with the attendant benefits of *both* operations. What's more, forging and rolling are combined in a single step that gives better grain flow.

As a result, there's high homogeneity and strength in the finished blank. Yes, strength at every point —without excessive weight.

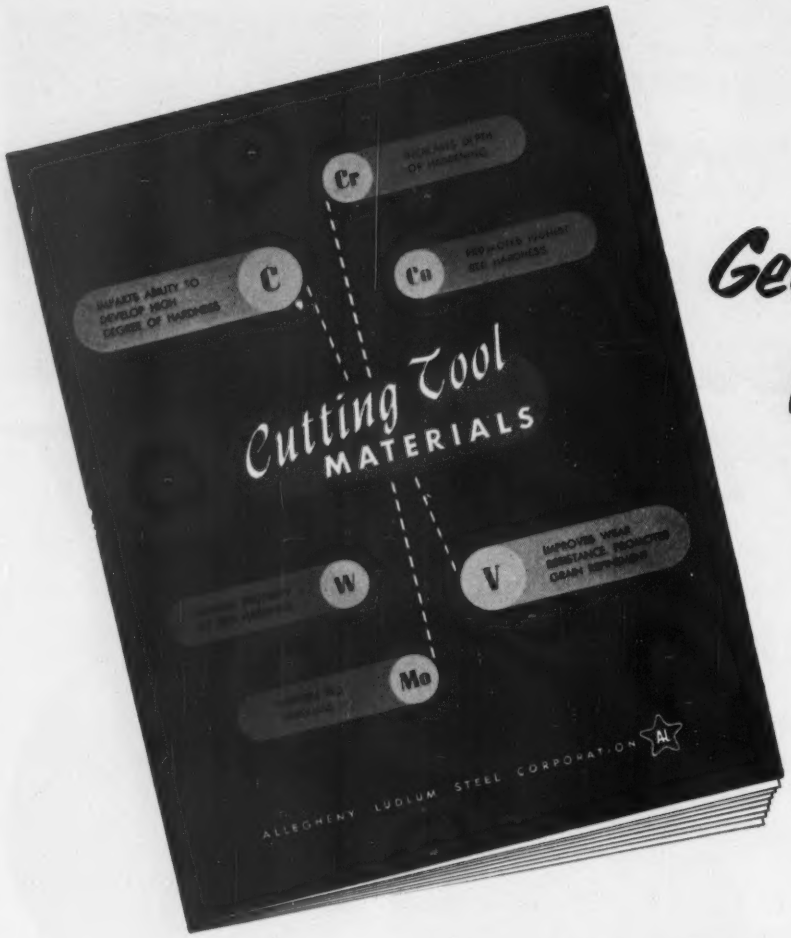
Bethlehem gear blanks are available in sizes from 10 to 42 in. OD—treated or untreated, as you specify. Ask for full details and a copy of illustrated Booklet 216.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM ROLLED-and-FORGED CIRCULAR PRODUCTS



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WRITE FOR IT TODAY!

LOOK in this BOOKLET

when you're *puzzled about Tool Materials!*

A-L OFFERS YOU
Complete Service for Modern Tooling

By "complete" is meant that Allegheny Ludlum produces the full range of modern cutting tool materials, hence is in position to know and recommend the type best suited for any stated purpose. Unbiased content makes the 8½" x 11" booklet, shown, all the more valuable. Specify its title, "Cutting Tool Materials."

ADDRESS DEPT. M-40

You should have a personal copy of this 36-page booklet close at hand, if you are continually running into new cutting problems. Use it as a guide to quick answers to scores of possible questions such as:

"Should we use *Carbide* on this job? What grade?" . . . or, "How about tooling up with *Cast Alloy* for that other run?" . . . or, "Can we cut this extra-tough stock fast enough with our usual grade of *High Speed Steel?*"

This booklet in no way replaces, but does supplement, what you can learn by practical experience or what you can gain by calling in an A-L tool engineer. In compact form and quite impartially, the booklet presents the basic facts that enable you to speedily compare the suitability of various tool materials for specific uses. *Send today for your free copy.* There is no obligation involved.

● *Allegheny Ludlum Steel Corporation, Henry W. Oliver Bldg., Pittsburgh 22, Pa.*

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W&D 3703

AL
FINE TOOL STEELS
SINCE 1854

Efficient Stripping of Rejected Painted Parts

When the volume of painting rejects slows down your rate of production—as may occur in the manufacture of rigorously-inspected defense equipment—it is time to plan an efficient method for stripping the faulty coatings.

The rejected parts represent a considerable investment in the cost of metal and the cost of fabrication. To hide 5% of your total production in a corner is like hiding 5% of your working capital in a sock. The quicker you reclaim those rejects and push them through as accepted parts, the better profit you make on your contract.

Sometimes the time element dictates more efficient stripping. Suppose that a sub-contractor undertakes to produce 100,000 parts in 20 days. Suppose also that he averages 5% rejects and that he lets them pile up until he has 5,000 to strip and re-process on the 20th day.

On that day he discovers with sorrow that it is a lot harder to strip and repaint 5,000 rejected parts than it was to paint his regular daily quota of 5,000 new parts. He misses his deadline and suffers embarrassment that could have been avoided by stripping 250 rejects each day for 20 days instead of 5,000 in one day.

Furthermore, it usually is much easier to strip the parts on the day they are rejected. Even though the parts were thoroughly baked in the ovens, it is still true that the longer the paint ages on the metal the harder it is to remove by any method of stripping.

Another point is that the easy method of dumping the rejects into an out-of-the-way tank for overnight soaking frequently is not the best way to strip the paint. Some paints cannot be removed by immersion in any one stripper, be it alkaline or acid or solvent. Yet many such paints respond quite readily to the right combination of two of these strippers.

The technique of rinsing is also important. Some paints yield only to a hot alkaline stripper followed by a hot rinse. Sometimes a cold rinse following a hot immersion seems to provide a shock that removes the paint with great speed.

The economy of finding the best stripping method is so great that it merits careful planning. It may also require the advice of a man who has had plenty of experience with all types of stripping operations. Such a man is the Oakite Technical Service Representative in your city.

The Oakite Representative has a broad array of stripping materials at his command:

- Oakite Stripper, Oakite Stripper M-3, Oakite Stripper R-6, Oakite Composition No. 45 and Oakite Composition No. 60 are alkaline materials that work with great speed and efficiency, whether used for reclaiming rejects from the painting line or for stripping conveyor chains, racks and hooks. These materials also are excellent for "killing" the oversprayed paint in water-wash booths.
- Oakite Test X is another alkaline material capable of removing many types of paint.
- Oakite Composition No. 17 (solvent) and Oakite Composition No. 64 (alkaline) are especially designed for safe stripping of zinc chromate primer from aluminum.
- Oakite Composition No. 15, Oakite Composition No. 15A, Oakite Composition No. 18 and Oakite Composition No. 56 are solvent strippers of great effectiveness, particularly on the newer types of synthetic enamels.
- Oakite Composition No. 57 is a viscous solvent stripper that has special value for its ability to adhere to vertical and inverted surfaces.
- Oakite Compound No. 33 is an acidic material that simultaneously removes oil and rust in addition to stripping certain types of organic finishes.

For more information on this subject, phone your local Oakite Technical Service Representative or mail the coupon at the right.

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DO REJECTS SLOW UP YOUR PRODUCTION LINE?

OAKITE PAINT STRIPPERS MAY HELP YOU BREAK THE BOTTLE'S NECK

When the volume of painting rejects slows down your rate of production—you may need one of the stripping materials described in Oakite's free booklet "How to STRIP PAINT." This compact illustrated booklet answers many questions that will help you work out better stripping procedures. As a metal processor you will be particularly interested in:

- **What's the best way to strip paint from metal parts too large to be soaked in tanks?** *See page 3.*
- **What is the cheapest way to strip metal parts in large volume?** *See page 9.*
- **What are the best ways to prepare stripped surfaces for repainting?** *See page 11.*
- **What strippers are best for removing oil-base paints?... Synthetic enamels, alkali-resistant plastics or resin-based paints?... Japans, wrinkle finishes, nitrocellulose lacquers, alkyds, phenolics and ureas?** *See page 12.*

FREE **For a copy of *"How to STRIP PAINT"* and for advice on your particular paint-stripping problem, just send us the coupon.**

Technical Service Representatives Located in Principal Cities of United States and Canada

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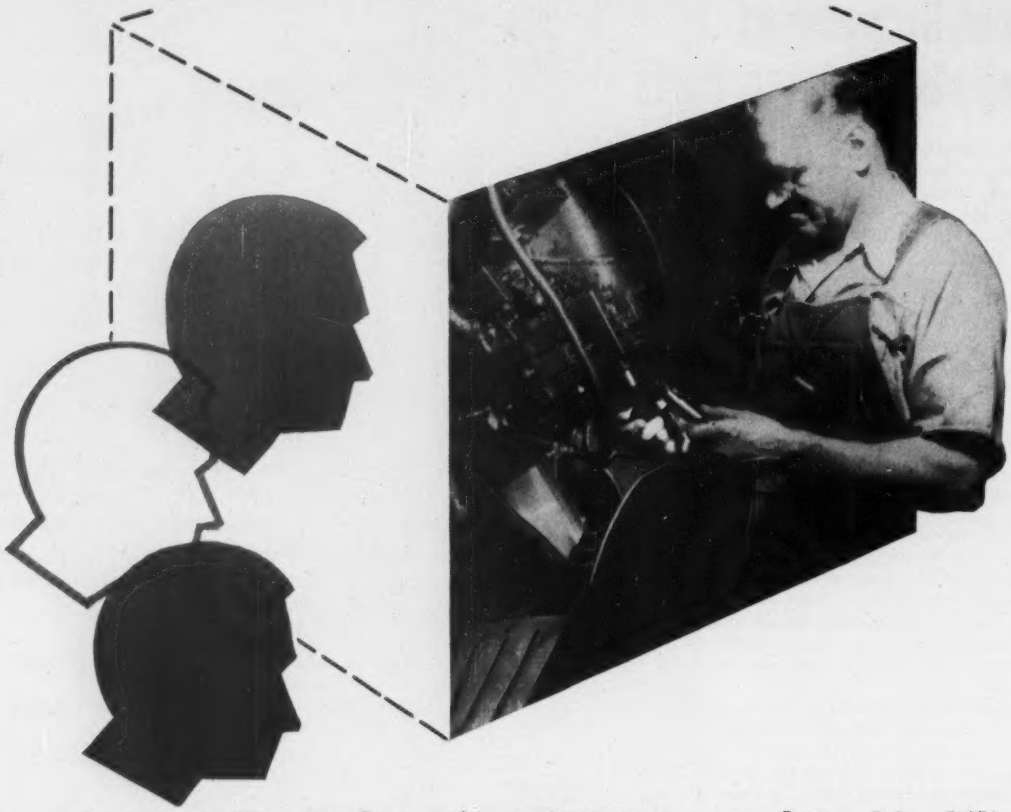
Name

Company

Address



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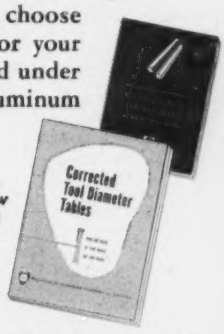

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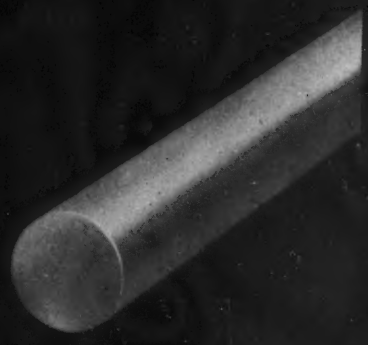
While you buy screw machine stock by the pound, you machine it by the foot. A pound of aluminum gives you three times more feet of stock than a pound of brass or steel.

Alcoa Aluminum

ALUMINUM COMPANY OF AMERICA



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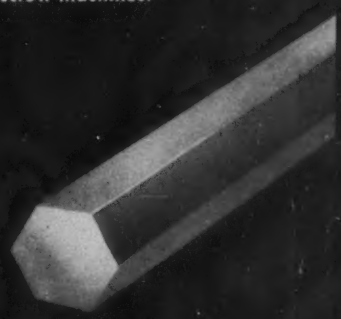
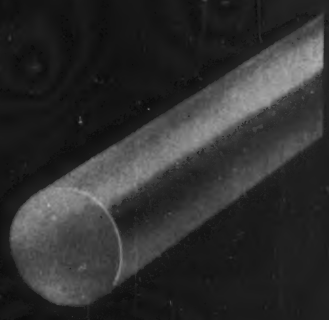
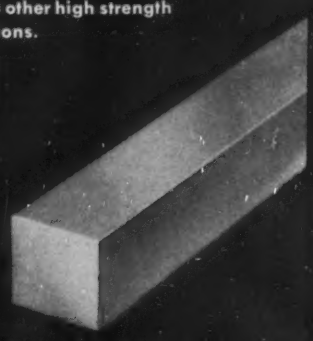
—the best general-purpose aluminum alloy for automatic screw machines.



ALCOA 17S-T4
—is stronger than 11S-T3, is better for deep hole drilling.



ALCOA 24S-T4
—is even stronger than 17S-T4 and is used for aircraft and other high strength applications.



ALCOA 61S-T6
—has high corrosion resistance and is best for anodized finishes.

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TOOL STEELS

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Nickel Alloyed Worms and Gears Still Serve after 30 Years of Operation

A nickel bronze gear, teamed with a nickel alloy steel worm, gives you gearing that actually improves with use.

Many years ago, after considerable laboratory and actual field tests of various compositions, The Cleveland Worm and Gear Company . . . specializing for the past 40 years in the production of speed reducers . . . standardized on nickel-tin bronze gears.

Today, many of their drive units which were produced in the early days, are still operating regularly with the original worms and gears . . . which means more than 30 years of useful service.

The reason for this long, trouble-free performance is not hard to find. For nickel improves the strength of standard bronzes and is particularly effective in raising elastic properties . . . increasing shock resistance as much as 25 to 50 percent.

Nickel-containing alloys may meet the exacting demands of your particular equipment or production problems. Write us, today, for counsel and data.

At the present time, the bulk of the nickel produced is being diverted to defense. Through application to the appropriate authorities, nickel is obtainable for the production of nickel alloyed bronzes for many end uses in defense and defense supporting industries.

NICKEL-TIN BRONZE . . . containing approximately 1½% nickel, 10½% tin, a maximum of 0.25% lead, the balance copper . . . is produced by several foundries for gear requirements of The Cleveland Worm and Gear Company of Cleveland 4, Ohio.

This company also uses Type 2317 (3½% nickel) carburizing steel for worms of large size, and Type 4615 (nickel-molybdenum) carburizing steel for the smaller sizes. Both of these steels are especially easy to handle in heat treatment, and consistently provide the hard surface and tough core so essential to efficient, long-lasting operation. Moreover, they withstand reasonably rapid grinding on automatic thread grinders without surface cracking or spalling.

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Summerill Pressure Tubing is Quality-Controlled from raw materials to finished product in one of the nation's most modern tubing plants. Only prime raw materials are used. As a result, you can depend on Summerill for top uniform quality of product—regardless of whether you buy a single length or by the carload. *And remember this:* Not one Summerill customer has ever received a "leaker," or reported a pressure tubing failure! Summerill Pressure Tubing is available in lengths up to 38 feet. • We'll gladly supply further details or technical assistance on request. Call or write: *Summerill Tubing Company Division, Columbia Steel & Shafting Company, Pittsburgh 30, Pennsylvania.*

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THE NEW COLD

...that has shops

They're talking about results obtained with J&L "1200" Cold Finished Steel in terms of:

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Equivalent compositions to the J&L "1200" series are published by the American Iron and Steel Institute, the Society of Automotive Engineers, and under Federal Specifications QQS-663.

However, evidence of *outstanding* performance is furnished by the records of shops who are using J&L's "1200" Cold Finished Steels in regular production runs.

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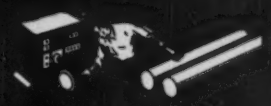
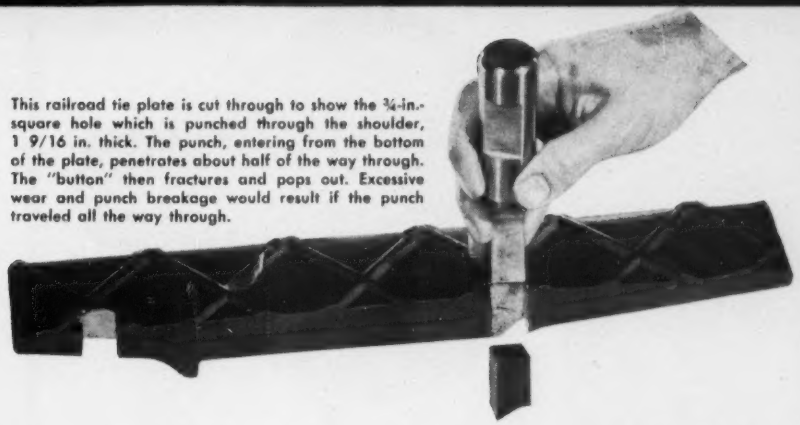
Tool Steel Topics



BETHLEHEM STEEL



This railroad tie plate is cut through to show the ¾-in.-square hole which is punched through the shoulder, 1 9/16 in. thick. The punch, entering from the bottom of the plate, penetrates about half of the way through. The "button" then fractures and pops out. Excessive wear and punch breakage would result if the punch traveled all the way through.

Omega Adds 5 Lives To Rugged Punches

When a punch can average only 54 holes before failure, you would figure that the job is a tough one. And you would be right. Punching ¾-in.-square holes through 1 9/16-in. of tough steel in railroad tie plates is no job for an ordinary tool steel.

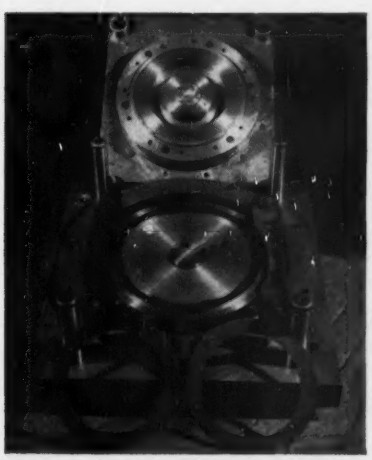
One of our metallurgical contact men studied this severe punching operation and recommended the use of our Omega tool steel. He pointed out to the shop men that it takes a shock-resisting tool steel — and a good one — to punch a hole that's smaller in diameter than the thickness of the steel. And in this case the steel plate is twice as thick as the width of the ¾-in.-square hole.

The first few punches made from Omega averaged well over 100 holes. So they made up 102 Omega punches and used them on a production basis. These produced 2 holes each in 18,160 plates — an average of 356 holes per punch, and more than 5 times the service life of the steel previously used.

This is another example of the way Omega can master heavy-shock applications. It's been doing a fine job for years on such tools as: pneumatic chisels, pawls, punches, knockout pins, swaging dies, shear blades, clutch and machine parts.

Omega is tops for cold-shock jobs. Your Bethlehem tool-steel distributor carries Omega in his stock for fast delivery. Its typical analysis:

C	Mn	Si	Mo	Va
.60	.70	1.85	.45	.20



⬅ Blanking High-Carbon Sheets

The excellent shock-resisting properties of our 67 Chisel make it a good choice for the blanking of clutch-plate discs from .09-in., high-carbon sheet steel. Operating in a 350-ton press, this die produces about 30,000 pieces before any redressing is needed. The die is hardened to Rockwell C-53.

Despite its reputation for shock applications, 67 Chisel has plenty of wear-resistance for blanking tools, punches, swaging dies, hot-work tools, shear blades and master hobs. It's easy to carburize 67 Chisel whenever extra wear-resistance is needed . . . without sacrificing its tough core.

Stocked by Bethlehem tool steel distributors, 67 Chisel is easy to machine and heat-treat. Its typical analysis:

C	Si	Cr	W	V
.50	.75	1.25	2.50	.20

Dies That Hold Their Size

Being machined is a piece of Lehigh H for a progressive die that will blank, form and draw a precision part from 3/16-in. steel strip. When you machine a piece of our Lehigh H tool steel you can be sure that it's going to hold those accurate dimensions during heat-treatment. Distortion and warpage are held to the very minimum.

This high-carbon, high-chromium grade is also first choice for long wear and high compressive loads. And because Lehigh H is air-hardening there's little chance of quenching-cracks, even when dies have intricate designs.

Lehigh H is stocked in many sizes by Bethlehem tool steel distributors everywhere. Its typical analysis:

C	Cr	Mo	V
1.55	11.50	.80	.40

BETHLEHEM TOOL STEEL ENGINEER SAYS:

It's better to grind round tool steel bars than to cold-draw them.

Because tool steel is inherently hard and brittle, it's ordinarily best not to specify that it be furnished in the cold-drawn condition. When very close size-tolerances are required, round bars are sometimes cold-drawn.

However, cold-drawing does *not* remove minor surface defects or decarburization. The surface of a cold-drawn bar must be machined off — just as with a hot-rolled bar — before tools are heat-treated. Otherwise, tools may crack in heat-treatment and will have a soft "skin."

It's better to finish round bars by centerless grinding, because the grinding does remove minor surface defects and decarburization. Tools can be made from ground bars without first machining off the surface.

Tool steel in sections other than round must usually be furnished cold-drawn if tolerances have to be close, because such sections as flats and squares cannot be surface-ground economically.

CUMBERLAND GROUND BARS

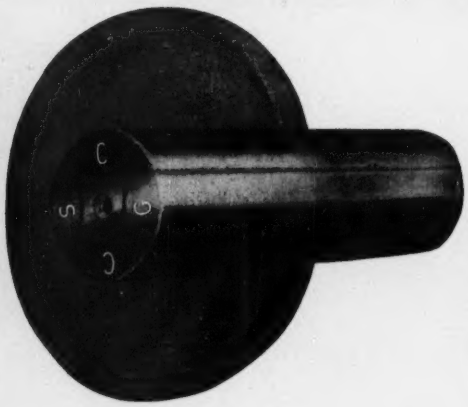
We manufacture 8" diameter, 7-1/2", 7", 6-1/2", 6", and also odd and intermediate sizes down to and including 1-1/8".

ON THE WEST VIRGINIA SHORE, OVERLOOKING THE POTOMAC RIVER, STANDS THE JAMES RUMSEY MONUMENT

The first practical steamboat in the world was run on the Potomac River a few miles below Cumberland, Maryland.

GEORGE WASHINGTON said in his diary, under date of September 6, 1784: "Remained at Bath all day and was showed the Model of a boat constructed by the ingenious Mr. Rumsey, for ascending rapid currents by mechanism; the principles of this were not only shown, and fully explained to me, but to my very great satisfaction, exhibited in practice in private under the injunction of secrecy—."

At a later date GEORGE WASHINGTON said in his diary: "Spent the afternoon with Mr. Rumsey and then Alexander Hamilton and I rode on to Cumberland, Maryland."



Symbol of Quality

Approximately 100 years after the exhibit of this steamboat, Cumberland began grinding bars. They found through experience this was the best method by which accurate steel bars could be produced. These bars are so carefully ground that they are adapted for mass production where gears, pulleys, sprockets and bearings must slide on the bars without delay due to filing or fitting.

IMMEDIATE BARS

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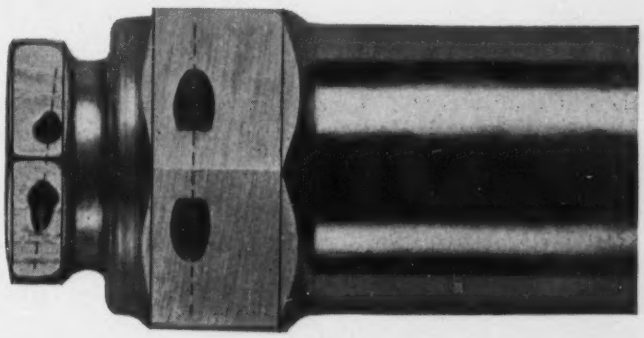
CUMBERLAND STEEL COMPANY

CUMBERLAND, MARYLAND, U. S. A.
ESTABLISHED 1845 **INCORPORATED 1892**

Is this troublemaker causing headaches in your shop?



(Note that the cross hole drilled on the part to the left—without preliminary spot facing—is on an angle and is not parallel with the face of the part. Further, neither side of the drilled hole is clean. Now compare it to the straight, clean hole on the right, drilled after spot facing.)

DRILLING CROSS HOLES

Recognize this common troublemaker? It involves drilling cross holes through angular sides of a hexagon head. Some shopmen tell us this job invariably causes them grief from the standpoint of high drill breakage and excessive wear on drill bushings resulting in poorly drilled holes. So one of our stainless service engineers recommended this easy cure: Before drilling, spot face where the drill enters the work. A simple spot facing fixture will do it. In this case the customer's fixture for drilling was O. K. for spot facing and the only tool needed to do this job was a drill ground with a flat end or a regular spot facer. If holes must be exceptionally clean, both sides should be spot faced.

Getting the answers to fabricating problems like this is part of doing business with Carpenter!

Isn't it worth a lot to know that the Carpenter Stainless you order is backed by a competent field engineering service to make Stainless fabricating better, easier, more economical? That's the way Carpenter likes to do business! It's one of the surest ways you have to get Stainless fabricating results you've always wanted.

And along with this helpful service, Carpenter brings you the finest Stainless money can buy. Originating in the same mill that invented the first Free-Machining Stainless, it means Stainless that feeds through your machines the same today, tomorrow and a year from now. So for really dependable Stainless backed by helpful shop service, get in touch with Carpenter. THE CARPENTER STEEL CO., 105 W. Bern St., Reading, Pa.

Export Department: The Carpenter Steel Co., Port Washington, N.Y —"CARSTEELCO"

Carpenter STEEL

Free-Machining Stainless

takes the problems out of production

Call your nearest Carpenter Mill-Branch Warehouse, Office or Distributor

MADISON-KIPP *Fresh Oil*

. . . FED UNDER PRESSURE
BY THE MEASURED DROP

the most dependable method of lubrication ever developed!

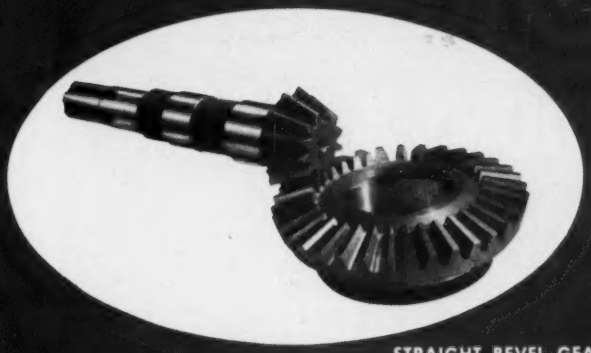
This lubricator becomes an integral part of a machine tool in which there are 48 vital bearings that require dependable lubrication. The Madison-Kipp mechanism is so compact that the reservoir measurements are only 4" wide, 19¾" long by 5¾ high."

There are six different models to meet almost every application requirement. Please write us for all details regarding your particular lubricator requirements.

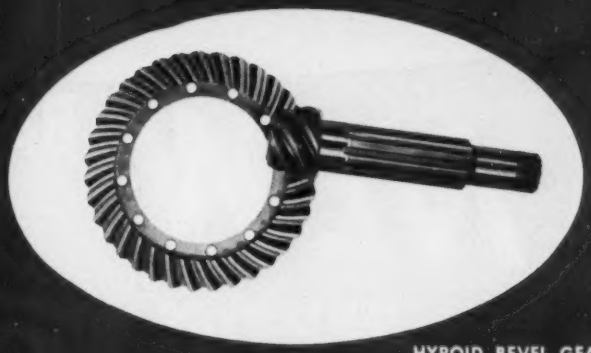
MADISON-KIPP CORPORATION
203 WAUBESA STREET • MADISON 10, WISCONSIN

kipp

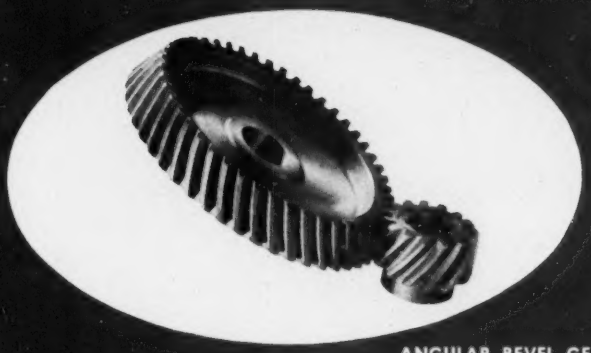
• Skilled in Die Casting Mechanics • Experienced in Lubrication Engineering • Originators of Really High Speed Air Tools



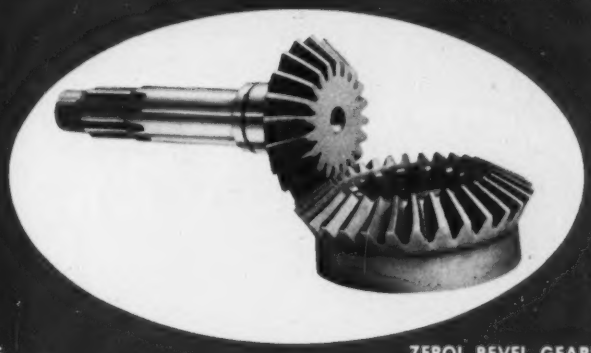
STRAIGHT BEVEL GEARS



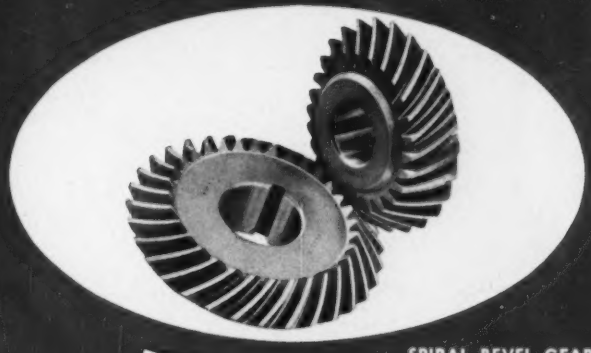
HYPOID BEVEL GEARS



ANGULAR BEVEL GEARS



ZEROL BEVEL GEARS



SPIRAL BEVEL GEARS

DOUBLE DIAMOND GEARS are designed and built...

✓ ...to produce low installed cost

✓ ...to serve economically and dependably on the job for which you buy them

✓ ...and to do credit to your product and your reputation.

WRITE FOR THIS CATALOG

AUTOMOTIVE GEAR WORKS, INC.

RICHMOND, INDIANA

FOR FARM EQUIPMENT, AUTOMOTIVE & GENERAL INDUSTRIAL APPLICATIONS

DOUBLE DIAMOND GEARS

TRADE MARK

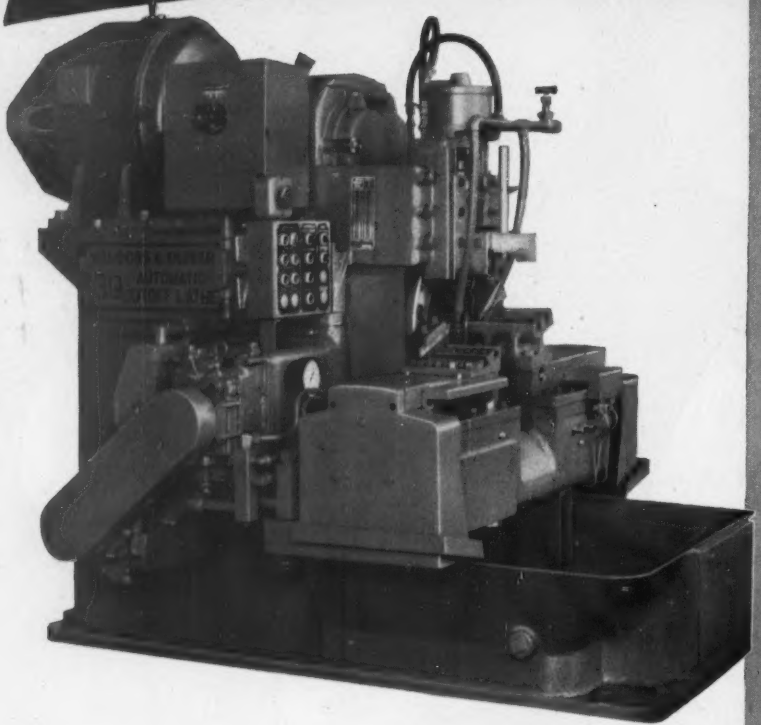
NEW BARDONS & OLIVER No. 38 and No. 39

(8 5/8" cap.) (9 5/8" cap.)

MILL TYPE CUTTING-OFF LATHES

✓FULLY AUTOMATIC FOR COUPLING WORK

✓SEMI-AUTOMATIC FOR CROPPING WORK



Featuring

HIGHER SPEEDS AND GREATER POWER FOR INCREASED PRODUCTION

- ☆ Spindle speeds up to 300 R.P.M. with up to 30 H.P. motor
- ☆ More rugged, dependable double tool slides
- ☆ Increased chucking power

Optional Extras

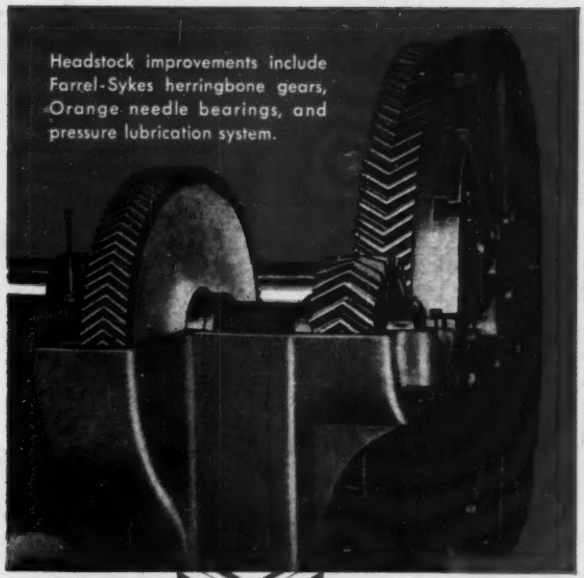
- ☆ Automatic or semi-automatic outside and inside chamfering attachments
- ☆ Speed accelerating device for cutting off solid bars
- ☆ Automatic stock loading tables
- ☆ Automatic stock unloading tables

ADDITIONAL SIZES OF BARDONS & OLIVER CUTTING-OFF LATHES			
No. 32 —	Capacity from	¼" dia.	to 2" dia.
No. 33 —	" "	½" dia.	to 3" dia.
No. 34 —	" "	¾" dia.	to 4" dia.
No. 35 —	" "	1" dia.	to 5-⅝" dia.
No. 36 —	" "	1½" dia.	to 6⅝" dia.
No. 38 —	" "	2⅜" dia.	to 8⅝" dia.
No. 39 —	" "	2⅜" dia.	to 9⅝" dia.
No. 312 —	" "	4½" dia.	to 12¾" dia.
No. 316 —	" "	6⅝" dia.	to 16" dia.

We also manufacture a complete line of Turret Lathes

BARDONS & OLIVER, INC.

1135 WEST 9TH STREET • CLEVELAND 13, OHIO



Headstock improvements include Farrel-Sykes herringbone gears, Orange needle bearings, and pressure lubrication system.

Huge, Rebuilt Lathe operates *Smoother Faster* with Farrel® Gears

In rebuilding a giant, 100" lathe, Simmons Machine Tool Corporation, of Albany, N. Y., used Farrel-Sykes herringbone gears to replace spur gears on the two final gear reductions.

With these new gears, new shaft bearings and a pressure lubrication system, Simmons was able to *double* the normal spindle speeds of the machine. Furthermore, on test, they found the rebuilt lathe to be "exceptionally smooth and quiet in operation for a machine of this size."

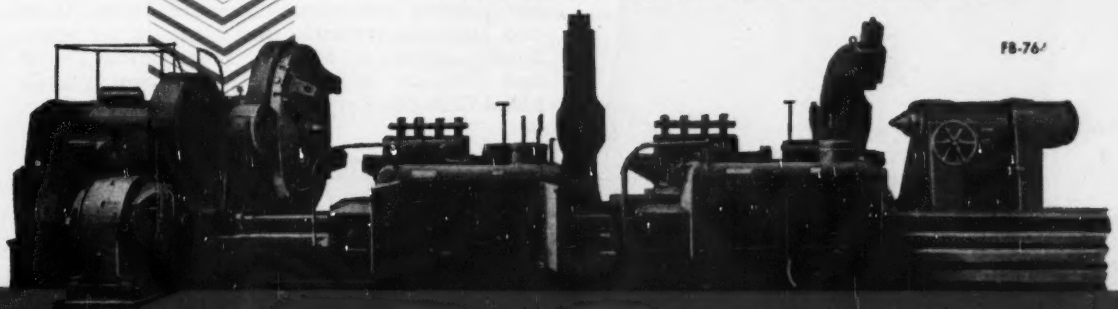
The quiet, vibration-free performance you can expect from Farrel-Sykes herringbone gears results from extreme accuracy of tooth spacing, contour and helix angle, and other qualities inherent in the Farrel-Sykes method of gear generation. They are made of the finest grade materials, in a complete range of sizes, for any power capacity and any application.

Wherever power transmission must be smooth and vibrationless under all conditions of load and speed, *specify Farrel herringbone gears.* Information and engineering assistance available, without obligation.

FARREL-BIRMINGHAM COMPANY, INC.
ANSONIA, CONNECTICUT

***Plants:* Ansonia and Derby, Conn., Buffalo, N. Y. • *Sales Offices:* Ansonia, Buffalo, New York, Boston, Pittsburgh, Akron, Detroit, Chicago, Memphis, Minneapolis, Portland (Oregon), Los Angeles, Salt Lake City, Tulsa, Houston, New Orleans**

FB-76



Farrel-Birmingham®

TALIDE TOOLS for Longer Runs and Higher Speed Performance!

GRADE	FOR MACHINING—CAST IRON, NON-FERROUS METALS AND NON-METALLIC MATERIALS
C-89	HEAVY-DUTY ROUGHING AND INTERRUPTED CUTS
C-91	GENERAL PURPOSE WORK UNDER AVERAGE CONDITIONS
C-93	PRECISION BORING AND FINISHING JOBS
	FOR MACHINING STEELS—INCLUDING CAST, FORGED, ROLLED, ALLOY AND HEAT TREATED
S-88	HEAVY HOGGING AND ROUGHING OPERATIONS
S-90	UNIVERSAL, ALL-PURPOSE MACHINING OF STEELS
S-92	LIGHT, HIGH SPEED PRECISION FINISHING

● Talide Tools and Tips are made by precision methods under rigid control. From ore to finished product — uniform quality is assured by 21 grueling tests including physical, chemical and metallographic control, backed up by over 25 years' experience in tungsten carbide metallurgy. You can depend on Talide metal to give uniform, cost-saving results on all types of metal-cutting operations. Standard Talide Tools and Tips are available from stock at our warehouses located in Newark, Youngstown, Detroit and Chicago. Write for General Catalog 52-G, Metal Carbides Corporation, Youngstown 7, Ohio.

Same-day or 24-hour delivery on Talide Tools, Tips and other products through warehouse stocks.

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MC
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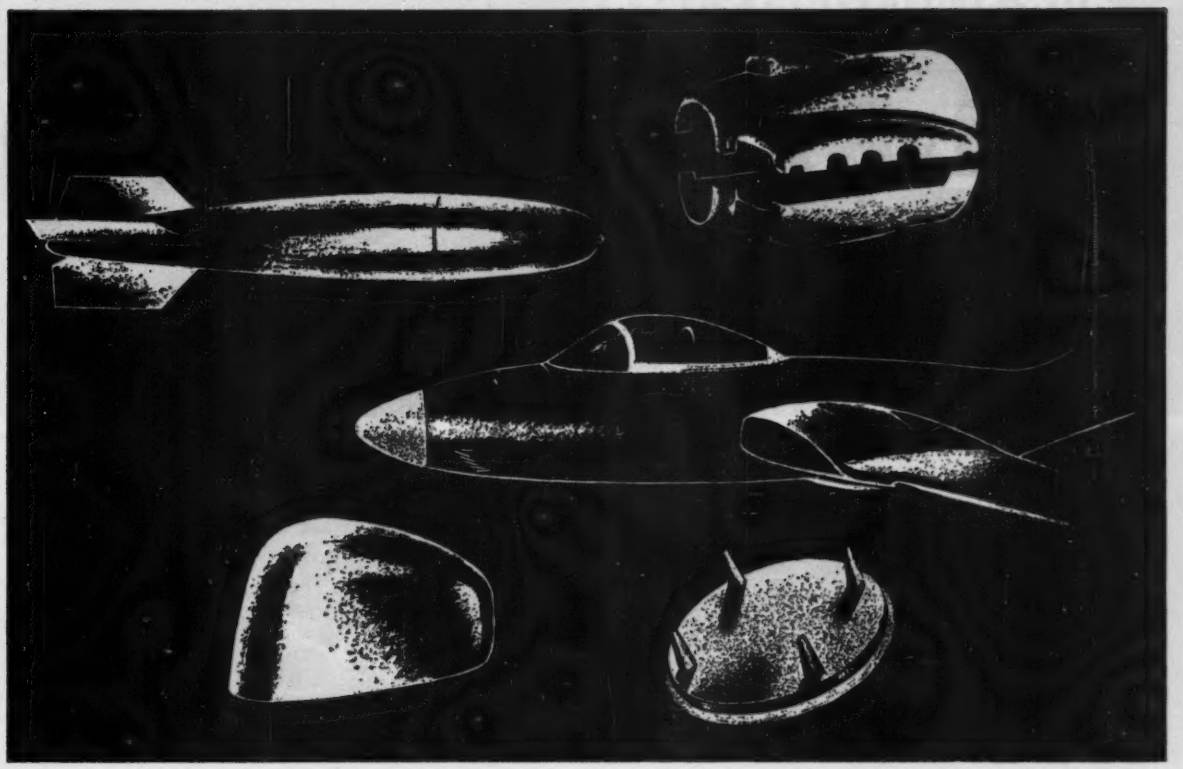
SINTERED CARBIDES · HOT PRESSED CARBIDES
TUNGSTEN ALLOY HEAVY-METAL
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY



A SIGNIFICANT ADVANCE IN AIRCRAFT ENGINEERING...
POLYESTER REINFORCED PLASTICS—

Designers have found a new way to increase strength and reduce weight in many components formerly made of metal. They're specifying reinforced plastics made of glass fiber cloth or mat, bonded with BAKELITE Polyester Resins.

Several different BAKELITE Polyester Resins, as well as grades of glass fiber cloth, are available to meet widely varying needs. For example, one type of reinforced plastic is produced from Owens-Corning "Fiberglas" cloth 181-136, laminated with BAKELITE Polyester Resin BRSQ-193, plus 10% monomeric styrene. The resulting laminate, when tested at standard conditions under U. S. Air Force Specification No. 12049, provides these physical properties:

Ultimate Strength, Flexural, Flatwise . . . . . 63,400 psi.
Ultimate Strength, Tensile . . 47,400 psi.
Ultimate Strength, Compressive, Edgewise . . 39,700 psi.
Impact Strength, Edgewise, (Notched Izod) 20.53 ft. lb./in. notch.

All of these values exceed the requirements of the specification. Yet, the specific gravity of this reinforced plastic, which contains about 36 to 38 per cent resin, is only 1.8.

Other properties, such as dielectric values, electrical "transparency" for radar housings, and heat and chemical resistance, are also covered in Booklet H-16, "BAKELITE Polyester Resins for Reinforced Plastics." Write Dept. OY-19.

BAKELITE
TRADE-MARK
POLYESTER RESINS

TRADE MARK

BAKELITE COMPANY
A Division of
Union Carbide and Carbon Corporation
UCC
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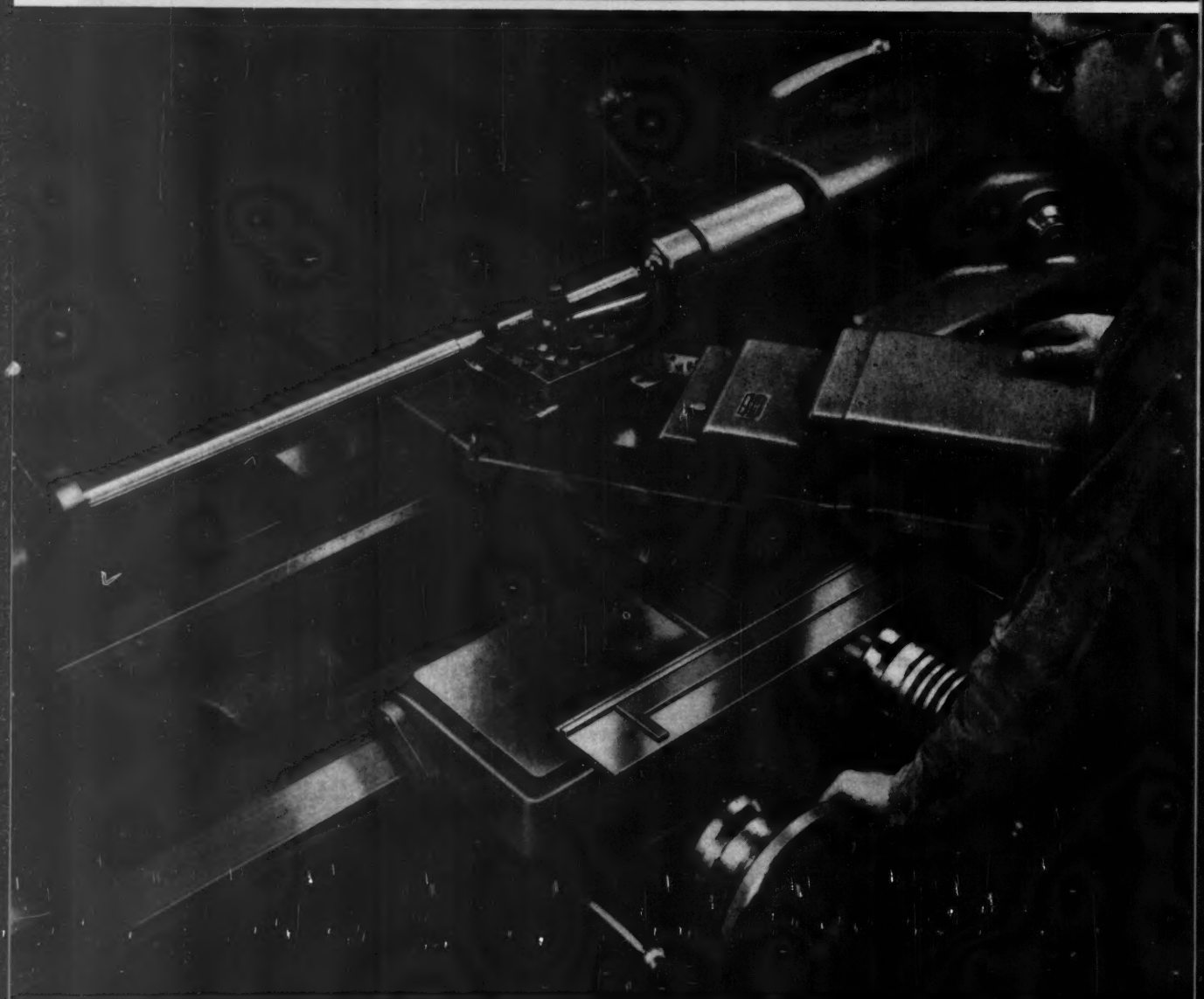
NOW SCULLY-JONES TURNS

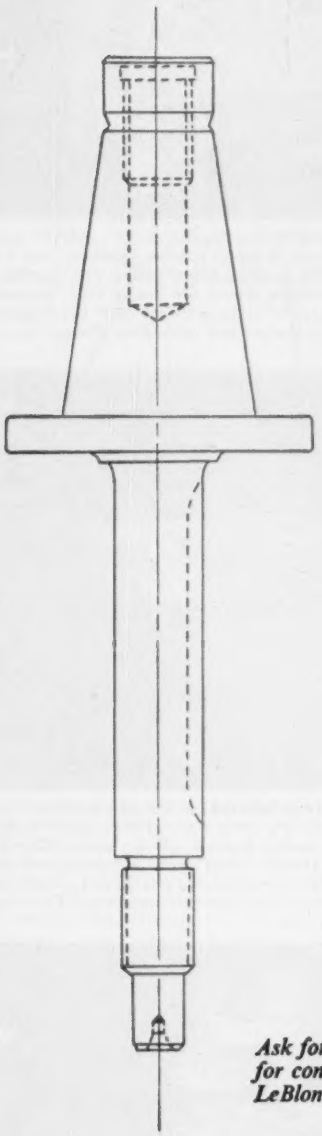
four arbors instead of 3...



Hydra-Trace (Trade Mark Registered U S Pat Off) is LeBlond's heavy-duty hydraulic tracing attachment can be mounted in place of the compound rest on practically all LeBlond Lathes built since 1935

same time, same lathe...

plus "Hydra-trace"*



When defense needs mushroomed demand for production equipment, Scully-Jones & Co. of Chicago found itself jammed with orders for milling machine arbors (they make more arbors than anyone else). Acting on advice from engineers at LeBlond's Chicago Office, Scully-Jones added Hydra-Trace to their LeBlond 16" RT Engine Lathe. Now they turn out four arbors in the time formerly needed to produce three—same lathe, plus Hydra-Trace.

Besides boosting output, this template-controlled hydraulic tracer saves 45% on set-up time, gives uniform precision without the need of a highly-skilled operator.

Stepless form-turning, contour facing, and turning step shafts are all in a day's work for Hydra-Trace. *Fits all LeBlond Engine Lathes built since 1935*, can be mounted easily in a matter of minutes. Templates are flat, compact, suitable for both rough and finish turning. They can be produced readily in your own plant, stored in limited space.

When turning requirements call for increased output—with present machines or with new equipment—you'll find just what you need in LeBlond's complete line of lathes and lathe attachments.

Call your nearby LeBlond Distributor or write—

Ask for Bulletin HT2A for complete details on LeBlond Hydra-Trace.

turned faster by

LeBLOND of Cincinnati

THE R. K. LEBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO

WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES • FOR MORE THAN 65 YEARS

In grinding...

You get the "TOUCH OF GOLD" from Norton

Norton grinding and lapping machines add value and profit to everything they produce

Only Norton offers you such long experience in both grinding wheels and machines to help you produce more at lower costs. Norton really gives you the "Touch of Gold" that increases product value and adds to product profit.

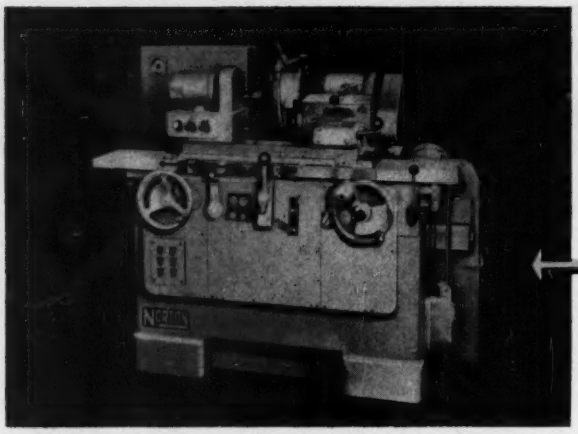
Take advantage of this experience to discuss with us your present grinding problems or your post-emergency production to fit tentative delivery schedules into your future plans.

To Economize Modernize With **NEW**

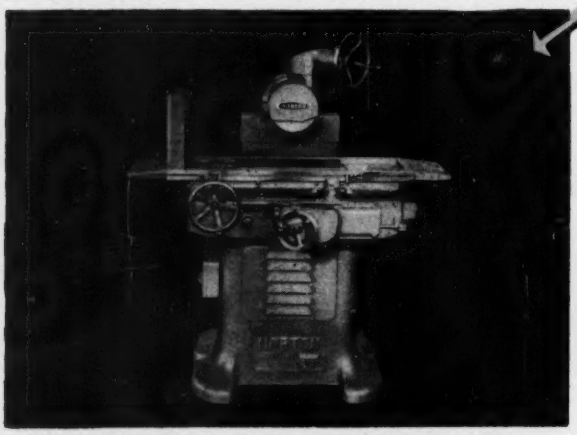
NORTON

GRINDERS *and* LAPPERS

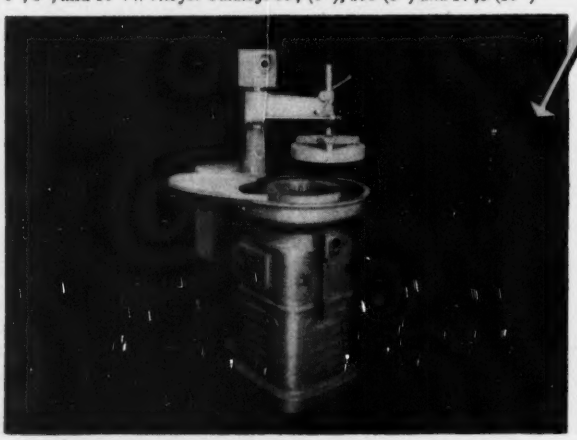
Making better products to make other products better



NEW NORTON 4" TYPE CTU Semiautomatic, in 12" and 18" work-length capacities, rounds out the Norton Cylindrical Grinder Line. Like the larger 6" and 10" CTU's, it offers you a unique combination of speed, accuracy, flexibility and sturdiness. All Norton CTU Semiautomatics have "one lever" control of automatic time cycle which reduces operator attention merely to loading and unloading. *Catalog No. 531* gives you all details.



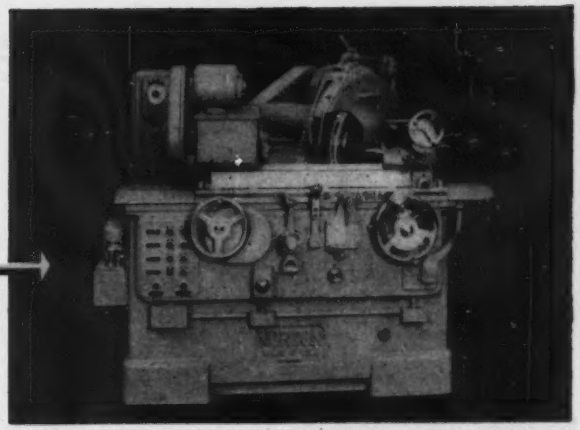
NORTON HYDRAULIC SURFACE GRINDERS, designed with both hand and hydraulic table traverse and cross feed, produce plane surfaces smoothly and speedily. Convenient controls and easy accessibility keep operating and maintenance time low. Such extras as a permanent magnet or direct current type chuck, wet grinding attachment or individual dust exhaust system help make a good basic machine better. Three sizes: 6", 8", and 10". *Write for Catalogs 954 (6"); 190 (8") and 1745 (10")*



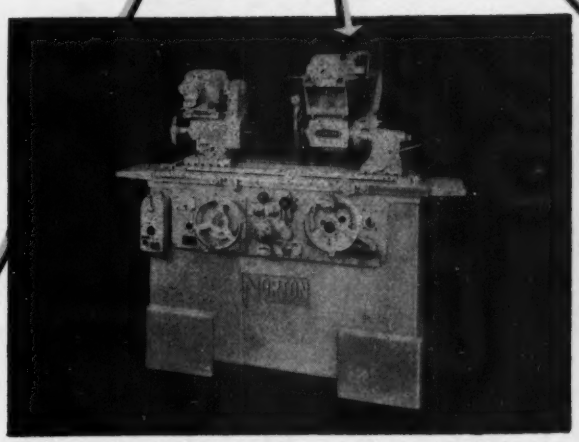
NORTON TYPE 16FC VERTICAL LAPPER produces either flat or cylindrical work to a high degree of dimensional accuracy, parallelism and finish. Widely used for such work as diesel injector parts, plug gages, size blocks, sides of small bearing races, pump gears and plates and other parts. Other Norton lappers are available. *Write for Catalog 212 and General Catalog 1843.*

Norton Grinders and Lappers

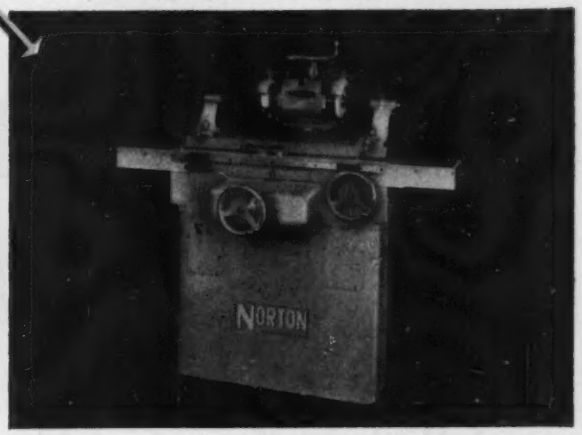
The world's most complete line



NORTON ANGULAR WHEELSLIDE GRINDERS are semiautomatic machines which simultaneously grind thrust surfaces and adjacent diameters to finest accuracy and finish. By eliminating the need for an extra operation, they cut over-all production costs. "One lever" control of automatic time cycle, as in CTU's, helps operators produce more with less effort. Two sizes: 6"x18" and 10"x36". *Catalogs No. 533 (6"x18") and 1793 (10"x36")* give you more information.



NORTON UNIVERSAL GRINDERS are so flexible they handle almost an endless variety of jobs. Compound swivel arrangement allows you to set and feed the wheel at any angle. External, internal, face or angular wheelslide operations come easy with Norton Universal Grinders. Four sizes: 10"x20" and 12", 14", or 16", each with work length capacities of 36", 48", or 72". *Write for Catalogs 170 (10"x20") and 1668 (12", 14", 16").*



NORTON NO. 20 CUTTER AND TOOL GRINDER, with its tilting wheel head, is the most versatile machine in its class. Wheel head tilts 15° above or below horizontal . . . may be swivelled 360° in a horizontal plane. Integral motor cartridge type spindle, duplicate controls for front or either-side operation are other features that make this machine first choice for toolroom grinding. *Write for Catalog 189.*

ONLY NORTON OFFERS YOU OVER 50 YEARS OF COMBINED EXPERIENCE IN:

Abrasives and Grinding Wheels + **Machines for** Cylindrical Grinding • Surface Grinding • Cylindrical and Flat Lapping • Universal Tool and Cutter Grinding • Universal Multipurpose Grinding • Specialized Grinding • Crankshaft Grinding • Cam Shaft and Contour Grinding • Roll Grinding.

NORTON COMPANY • MACHINE DIVISION • WORCESTER 6, MASS.

District Sales Offices: Hartford • New York • Cleveland • Chicago • Detroit

In Canada: J. H. Ryder Machinery Co., Ltd., Toronto 5

GORTON Brings You High Production

Automatic Profiling of CAMS AND CAM-LIKE SHAPES

Gorton Contour Mill, CM-12, Produces Extreme Accuracy and High-Surface Finish with Minimum Maintenance

This machine produces highly accurate, identical pieces — complicated cam shapes, external or internal, or continuous grooves and slots of irregular radii. The Gorton Contour Mill is easy to use and versatile — a simple tracer-controlled, vertical-head milling machine with two rotary power-driven tables. No complicated electronic, hydraulic or pneumatic controls.

CAPACITY . . .

Wide spindle-speed range — 300 rpm to 10,000 rpm — for either high-speed steel or carbide cutters, burrs or grit grinding wheels. The 16-inch master-copy table easily accommodates larger master cams. Several thin cams can be stacked and profiled at once.

EXTREME ACCURACY . . .

Operation depends upon a heavy, single-pivot beam which provides more accuracy than can be built into the tooling. A choice of several reduction ratios adds to accuracy and provides low micro-inch finishes. The reduction ratio principle produces piece parts to closer tolerances than those of the master.

CUSTOM-DESIGNED . . .

The basic machine is standard, but each mill is tooled for specific work. Because all machine elements are individually motor-driven, the machine can be adapted to a wide range of applications. Write for complete details and your copy of Special Bulletin 2380-C-1304.

GEORGE GORTON MACHINE CO.

1304 RACINE STREET • RACINE, WISCONSIN, U. S. A.

BALANCED DESIGN

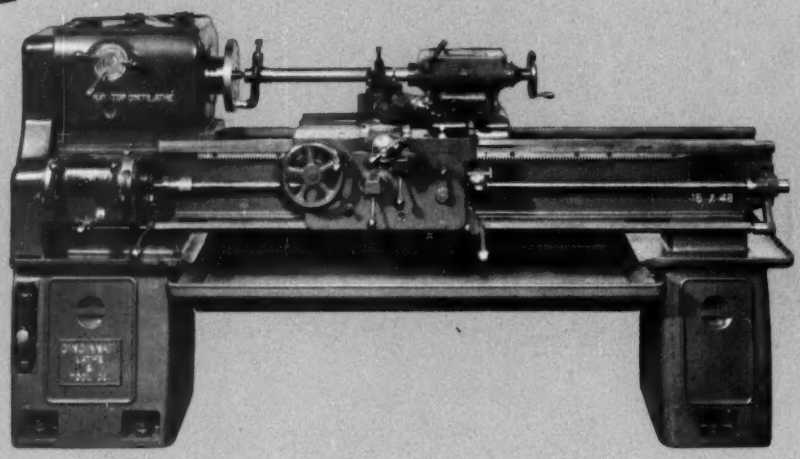
Tray-Top Cintilathes make friends of your customers by helping you deliver top quality work at less cost. Every pound of weight, every gear, shaft, bearing, every working component, every control — does its part to improve your products and lower your costs. If your business is competitive, compare the work you are getting from your present machines with the performance you can expect from Tray-Tops per dollar invested. Your Cintilathe dealer will gladly arrange a demonstration.

best buys in their class!

CINTILATHE

CINCINNATI LATHE & TOOL CO., CINCINNATI 9, OHIO, U. S. A.

MORE QUALITY FEATURES



WIDER WORK RANGE

MAXIMUM CONVENIENCE

SIMPLE INSTALLATION

EASY MAINTENANCE

SUSTAINED ACCURACY

ECONOMY PRICED

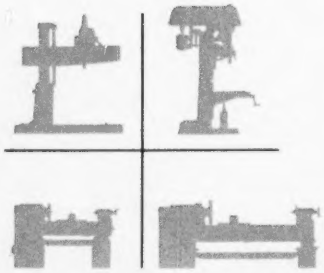
12 spindle speeds in geometric progression with an all geared transmission . . . Large spindle mounted in three precision anti-friction bearings . . . Direct-reading color-match speed shift . . . Double walled, one piece apron with automatic lubrication . . . Totally enclosed, automatically lubricated, quick-change gear box, incorporating leadscrew reverse . . . Flame hardened gears in headstock, quick change box, and apron . . . Ground bedways (flame hardened at extra cost).

CINTILATHES: The complete, balanced line,
Tray-Top for light duty (engine, toolroom and gap bed models),
10", 12½", 15", 18" sizes; 18" to 114" center distances.
Model LT for medium duty (engine and gap bed models).
16", 18", 20", 24" sizes; 30" to 264" center distances.
Write for catalogs and name of your nearest dealer.

best buys in their class!

CINTILATHE

CINCINNATI LATHE & TOOL CO., CINCINNATI 9, OHIO, U. S. A.



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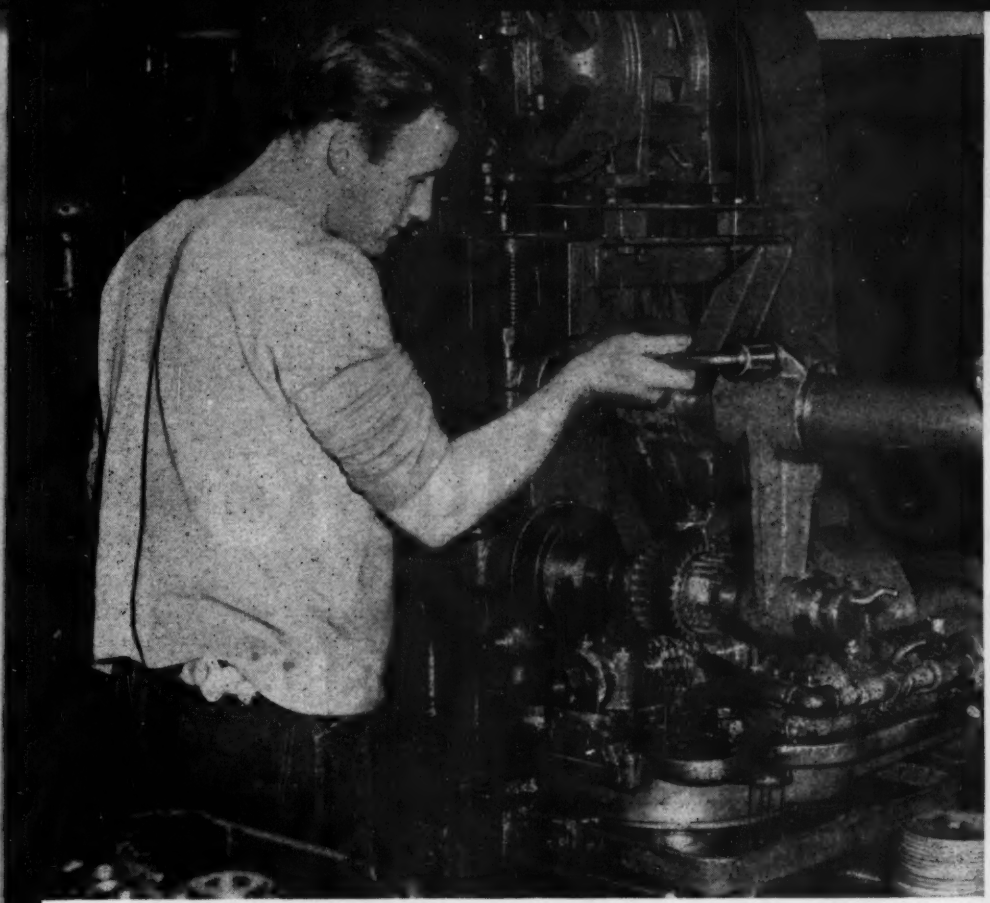


Hob life increased 75%

● The Gear Products Company, St. Louis, Missouri, tried various cutting oils for the hobbing of door latch spur gears from *a free machining* steel. With the best of the oils, an average of only *600* pieces could be produced before hobs required sharpening.

A Standard Oil lubrication specialist recommended PREMIER Cutting Oil, a light-colored, sulfurized cutting fluid. With the use of PREMIER, an average of *1050* pieces have been produced before hobs have required sharpening —a 75% increase of hob life. Less downtime for tool changes has resulted in higher production. Fewer sharpenings have significantly reduced tool costs.

The Gear Products Company, specializing in precision gears, gear trains, now uses PREMIER Cutting Oil for the majority of its gear cutting jobs. This has simplified both stocking and application of cutting oil.

Whether you have a specific problem or are looking for better results, a Standard Oil lubrication specialist can help you. His experience and special training are backed by one of the finest and most complete lines of cutting oils and lubricants on the market. You can contact him easily by phoning your local Standard Oil (Indiana) office. Or write: Standard Oil Company, 910 S. Michigan Avenue, Chicago 80, Illinois.

What's YOUR problem?

Fred. H. Moulton, lubrication specialist in Standard Oil's St. Louis office, worked closely with the Gear Products Company to help them get significantly greater tool life on the hobbing job described at the left.

To help you get better results with cutting oils and lubricants, Standard Oil has a corps of lubrication specialists located throughout the Midwest. One of these men is near your plant. He will give you the assistance you need when you need it. His wide experience and special training in the use of modern lubricants and cutting fluids will help you make real savings. You can reach him quickly and easily by phoning your local Standard Oil Company office. His services are backed by a supply set-up that is unique in the oil industry and that can mean convenience and savings for you.

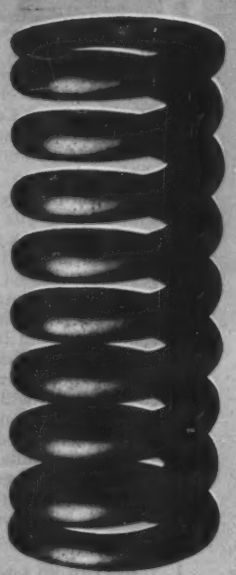
STANICOOL HD Soluble Oils. Because of additional compounding, this heavy-duty soluble oil possesses the cooling ability of an emulsion and also gives better tool life and finer finishes than do conventional soluble oils.

STANOSTAMP Compounds. These widely accepted products have demonstrated their ability to handle heavy stamping or drawing operations of low-carbon or alloy steels. Each of the three grades is a paste compound to which water can be added to provide the most economical applications. STANOSTAMPS offer maximum protection for dies and work, can be readily removed in conventional washing equipment.

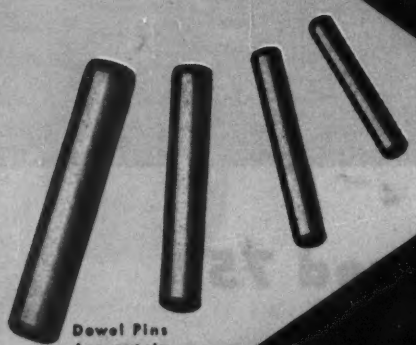
STANDARD OIL COMPANY STANDARD *(Indiana)*

Don't risk DIE BREAKAGE!

Specify PRODUCTO ACCESSORIES



High-Pressure Springs made of Chrome-Vanadium Steel



Dowel Pins Accurately Ground for Precision Dies

If an inferior spring breaks . . . it might mean trouble during the stamping operations and could possibly cause a several thousand dollar die to be damaged. More than that, losses pile up as press down-time and maintenance costs climb.

Protect the big investment, the die itself . . . *buy only quality die accessories.* Call your nearest Producto representative or branch for prompt service. Directory listings are found in all principal stamping centers.

Check List of Producto Die Makers' Accessories

High Pressure Springs	Die Rubber
Square Wire Springs	Dowel Pins
Medium Pressure Springs	Stripper Bolts
Guide Pins and Bushings	Cap Screws

THE PRODUCTO MACHINE COMPANY
985 Housatonic Ave., Bridgeport 1, Connecticut

For Die Accessories *Fast*, Call . . . PRODUCTO

MAKERS OF DIE SETS, PRESS FEEDS, VISES, TOOL ROOM EQUIPMENT

1PD88

Industry's Favorite

DIE STEELS

for

COLD WORK

SELECTED FOR

- Machinability
- Hardenability
- Dimensional Stability
- Wearability

COLONIAL NO. 6

NON-SHRINKABLE

Oil hardening. Combines machining ease with low hardening temperature and excellent stability. Very widely used.

OHIO DIE

Air hardening. High carbon, high chromium alloy with exceptional resistance to wear, providing long die life.

AIR HARD

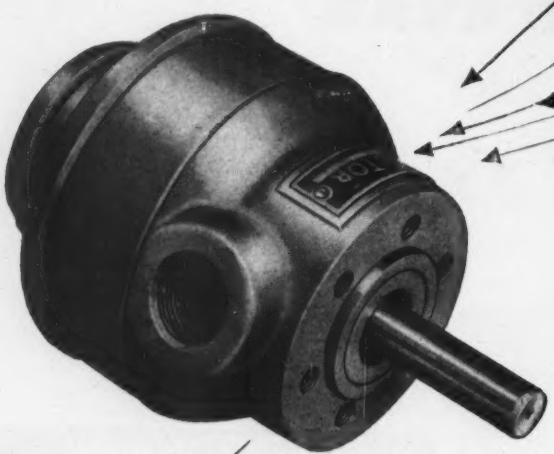
Air or oil hardening. A fine steel for intricate dies where movement cannot be tolerated.

These leading First Quality Die Steels cover the field of your most exacting cold work requirements. Specify them *by brand*, and get the distinctive performance built into each by complete control of manufacture—from our exclusive melting formulas to the last laboratory and production checks of the finished steels. ● Do you have our 24-page Cold Work Die Steel Catalog?

Vanadium-Alloys
STEEL COMPANY
LATROBE, PA.

COLONIAL STEEL DIVISION • ANCHOR DRAWN STEEL CO.

the "label" tells you it's unique



See the Gerotor name-plate on a hydraulic pump and you know what's inside . . . the renowned Gerotor mechanism. Both elements revolve in the same direction at low relative speed . . . minimizing friction, wear and slippage . . . assuring longer life, smoother flow, higher efficiency at lower operating cost.

Gerotor pumps are available in eleven sizes, some engineered for pressures up to 1200 p.s.i. continuous, 1500 p.s.i. intermittent. Deliveries range from .4 g.p.m. at 1800 r.p.m. to 40 at 1200. Plain, base or flange mountings. Specify Gerotor!

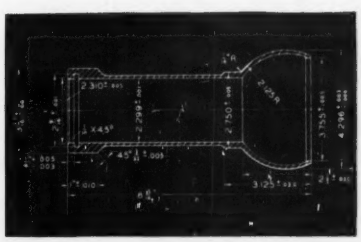
Gerotor May Corporation, Box 86, Baltimore 3, Md.

no other hydraulic pumps are like

GEROTOR
HYDRAULIC PUMPS

Gift Wrapped—

A Customer's Job-Proved View of the Mona-Matic



BALL HOUSING (left): Fabricated steel. Turn ball and opposite end diameter; bore and form internal groove. Limits ±.001". Replacing battery of 4 machines, Mona-Matic raised production from 150 to 260 parts per day. **SLEEVE** (right): Steel. Bore and internal chamfer both ends. Production increased from 20 to 70 parts per hour.

Gift? Here are the facts, the job and the results. You decide what you'd think, if it were your job!

The National Machine Works, Oklahoma City, produces a fine drive shaft housing repair kit, consisting of a steel sleeve and ball housing (see details, left). Previously, 4 machines—4 operators—were required.

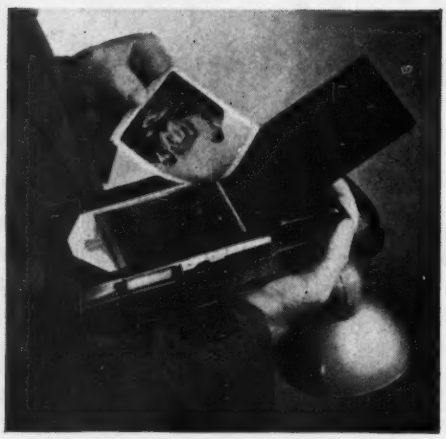
Now, thanks to the Mona-Matic's built-in gift for boosting output (plus savings on setup, form tools, tool change and grinding) this happy user is not only handling production with *one* machine, but has also materially increased production. If that doesn't strike you as a gift, consider this fact—this Mona-Matic, not even operating full time, has *paid for itself in less than one year!*

The Monarch Mona-Matic, briefly, is a fully automatic cycle, high-speed, Air-Gage Tracer controlled, single running tool turning machine —easily set up, extremely accurate, with infinite feed range and integrated rear carriage. It is furnished in a variety of versions, all proved in both long and short runs.

We've prepared Booklet #1805 giving the full story of the Mona-Matic—complete with data, specifications and many other job reports. Even if you don't believe in gifts, there's no time like the present! Write now . . . *The Monarch Machine Tool Company, Sidney, Ohio.*

Monarch
TURNING MACHINES
ACCURACY • ECONOMY • LONG LIFE

FOR A GOOD TURN FASTER . . . TURN TO MONARCH



Polaroid's "picture-in-a-minute" camera depends on BRASS

Snap the shutter on the famed Polaroid *Land* camera and a minute later you can have the processed, finished print.

When the Polaroid camera goes into action, a lot of precision-made brass parts go along with it. Each is of the composition, form, temper and finish most suitable for the purpose. Each contributes its share to a longer service life because of its durability, and its resistance to wear, fatigue and corrosion.

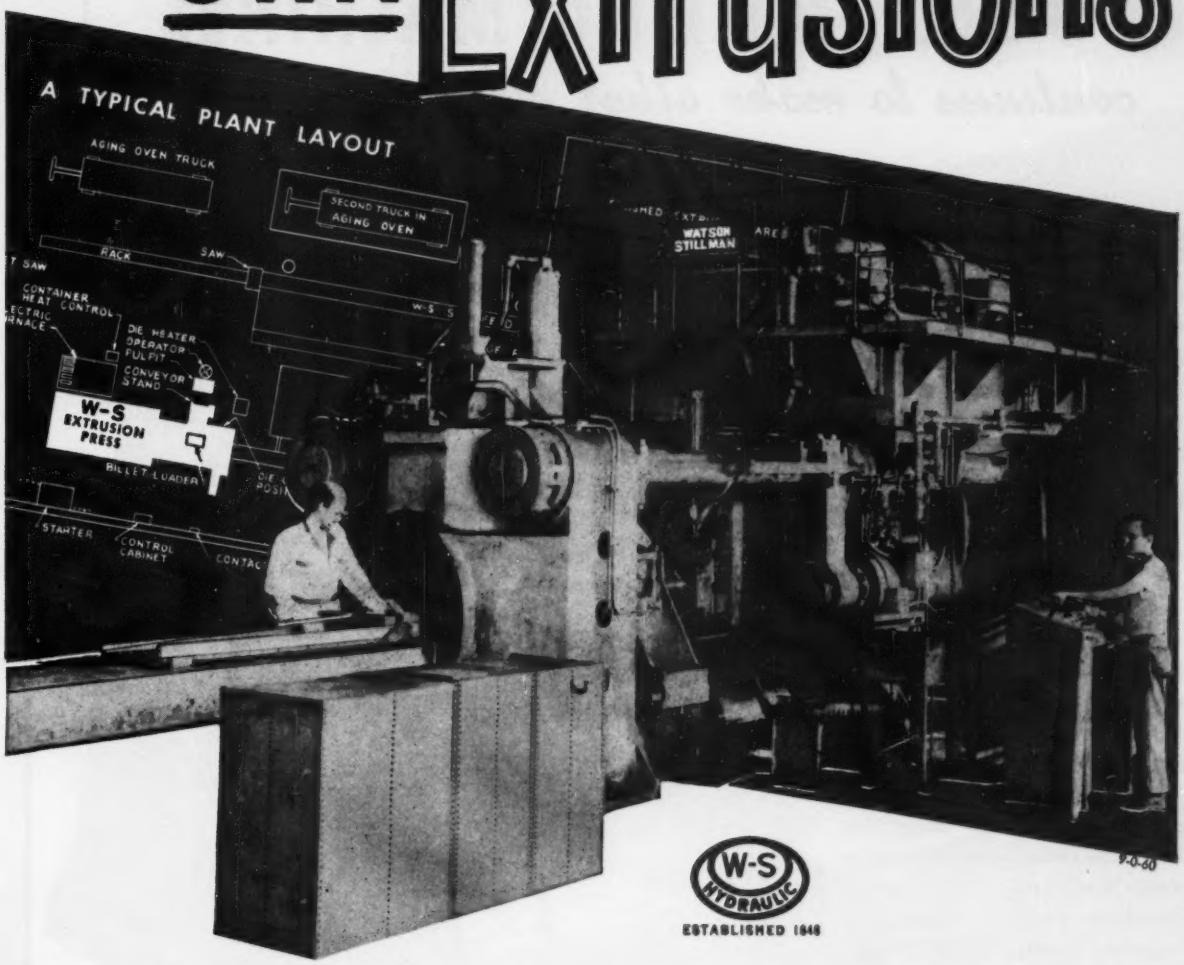
Little wonder that so many instrument makers depend on Brass...with so much of it from the mills of The American Brass Company.

THE AMERICAN BRASS COMPANY
General Offices, Waterbury, Conn.
In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.

MAKERS OF

ANACONDA®
COPPER, BRASS & BRONZE

Make Your OWN Extrusions



W-S HYDRAULIC
ESTABLISHED 1948

Chances are you wouldn't think of making your own paper clips or generating your own electric power. But don't be quick to class *extrusions* with those purchased items costing very little more than the raw materials from which they are made.

Fact is—as scores of aluminum fabricators have discovered within the past two years—you can profit in *many* ways by making your own extruded sections with W-S Aluminum Extrusion Presses.

HERE'S HOW:

Reduce Inventory: billets cost but a fraction of extruded product . . . savings provide part capital for equipment purchase.

Control Supply: you *make* the sections you want . . . *when* you want them.

Control Quality: establish and observe tolerances to suit the job.

Let us show you what in-plant extrusion has done for others . . . and how it can work profitably for you.

EXTRUSION PRESS HEADQUARTERS

THE WATSON-STILLMAN COMPANY

DIVISION OF H. K. PORTER COMPANY, INC.

161 ALDENE RD., ROSELLE, NEW JERSEY

Extrusion Presses for: Aluminum • Brass • Copper • Magnesium • Lead and Lead Covering • Carbon • Silver Alloys • Steel • Crayon • Ceramics • Cordite

Bridgeport

TURRET MILLING MACHINES

continue to make other methods obsolete

NO matter how you figure it, today's work cannot be handled economically on yesterday's machines and old-fashioned tooling. . . . In terms of speed, accuracy, convenience and costs, obsolete methods are a liability . . . never an asset.

How are your machines dated . . . '52 . . . '42 . . . '32 . . . or what? Can you mill, drill, bore or shape . . . at all angles of the work . . . without changing set up?

We suggest you investigate the advantages offered by "BRIDGEPORTS" and compare the possibilities with what you are trying to accomplish on existing equipment. Once you've done this, you'll do what countless other shops are doing . . . and replace obsolete machine tools with modern, proved BRIDGEPORT TURRET MILLING MACHINES.

(Left) **Light Duty** . . . for right angle milling and drilling narrow, deep molds and cavities.

RIGHT ANGLE ATTACHMENTS

(Left) **Heavy Duty** . . . for milling and drilling at right angles. Fits both Master and 1 HP Bridgeport Heads.

MILLING MACHINE VISE

An improved vise providing great gripping power. Streamlined for attractiveness and equipped with coolant trough. Rigid holding through screw of large diameter. Made in two sizes: 5"x3½" and 6"x5" jaw openings.

NO. 2 BORING HEAD

Boring Tools and Holder provide the means of boring holes up to 6" diameter. Available for use on Bridgeport 1 HP Milling, Drilling and Boring Attachment.

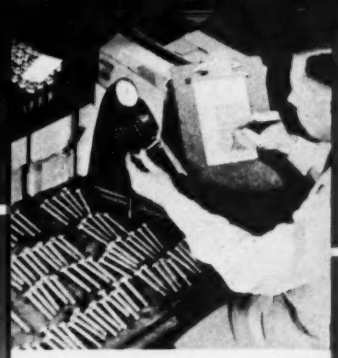
Condensed Specifications

- 8 Spindle Speeds . . . from 80 to 2720 RPM.
- Back Geared Spindle Drive Unit: utilizes full power at all speeds without belt slippage.
- Power Feed to Quill: 3 steps . . . .0015, .003 and .006 in. per spindle revolution.
- Quill Travel: 5".
- Spindle Brake and Lock for convenience in changing tools.
- Collet Capacity: up to ¾" diam.

Bridgeport MACHINES, INC.

Bridgeport, Connecticut

Manufacturers of High Speed Milling Attachments and Turret Milling Machines



FEDERAL has E for

MIKEMASTER
Indicating Micrometer

INSIDE DIAMETER GAGES
Wide diversity of types for various requirements from ⅛″ diam. up.

OUTSIDE DIAMETER GAGES
SNAP GAGES — to fit particular needs and all dimensions from 0″ up.

COMPARATORS
Electronic super-precise and Dial Indicator types to suit your particular need.

THICKNESS GAGES
Bench and Portable to suit special industrial specifications.

DEPTH GAGES
Faster and more accurate than old style flush pin gages.

THREAD GAGES
Thread Lead accuracy is as important as Pitch Diameter.

GAGE ENGINEERING
Over 30,000 special designs. We can modify stock gages to suit, or completely design and build gages to fit your need.

Federal offers you: The greatest assortment of gages for inspecting all dia

200P-1 INDICATING MICROMETER

INSIDE DIAMETER GAGES

368-6 INTERNAL AND EXTERNAL COMPARATOR

1203 SERIES HOLE GAGES

1201P SERIES HOLE GAGES

1243 AND 1242 SERIES LONG RANGE HOLE GAGES

OUTSIDE DIAMETER GAGES

1000 SERIES ADJUSTABLE SNAP GAGES

1340 SINGLE PURPOSE GAGE

1330P-100 SERIES RETRACTABLE ANVIL GAGES

264 HEAVY DUTY GAGE

236 SERIES SHALLOW DIAMETER GAGES

THICKNESS GAGES

691B THICKNESS GAGE

578-1, 2, AND 3 LONG RANGE THICKNESS GAGES

22P LONG RANGE THICKNESS GAGE

GAGE ENG

KB222 THICKNESS GAGE

2028-130 PITCH DIAMETER AND CONCENTRICITY GAGE

2368-253 HEIGHT AND DIAMETER GAGE

MACHINERY
April, 1953
Printed in U.S.A.

FEDERAL has *Everything* in Gages

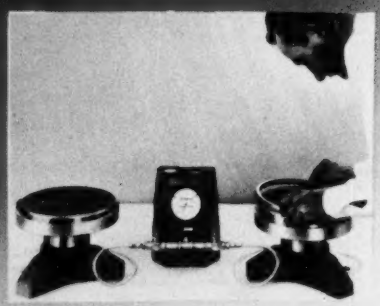
for Dimensional Control

Air Gages, Picture Panel, Continuous Measuring and Size Control Gages enable Federal to meet every dimensional control requirement.

DIMENSIONAIR — AIR GAGE

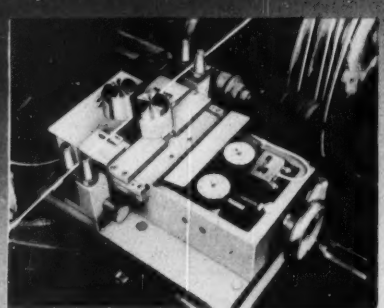
THE DIMENSIONAIR is really an outstanding gage. Its greater range, calibrated scale, stability, ease of setting, low maintenance, and the economy of its single master are well worth your investigation. Write for catalog.

At right: Two large diameter, *six*-jet plugs inspect thin rings for diameter at six points. Automatic guide sleeves on plugs make rings slip on easily.

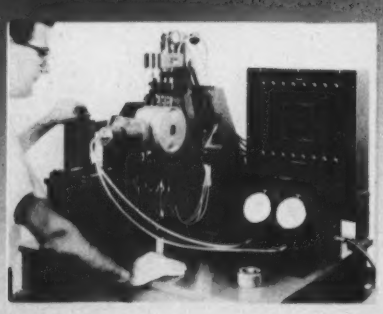


PICTURE PANEL — CONTINUOUS MEASURING

Left: Federal Continuous Gages not only measure the thickness of round or flat material but they control it by adjusting the machine to compensate for variations out of tolerance.

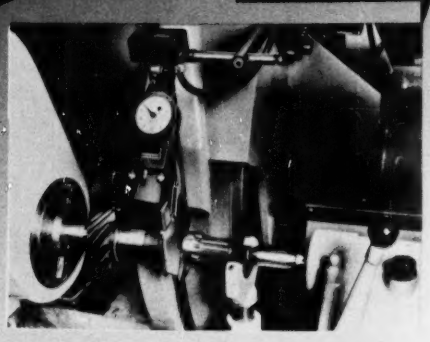


Lower Left: Multiple dimensions are inspected simultaneously and quickly with Federal Picture Panel Gages. This one gages 10 dimensions in two operations. Both the Federal Dimensionair and Federal Electricators are used.



SIZE CONTROL

LOOK INSIDE FOR DIAL INDICATOR GAGES



Automatic Machine Control for machining workpieces to *size* is a new Federal development that ties into modern trends. The gage automatically adjusts the machine so that all parts are produced in tolerance.

MACHINERY
April, 1953

FEDERAL PRODUCTS CORPORATION
1144 EDDY STREET **PROVIDENCE 1, RHODE ISLAND**

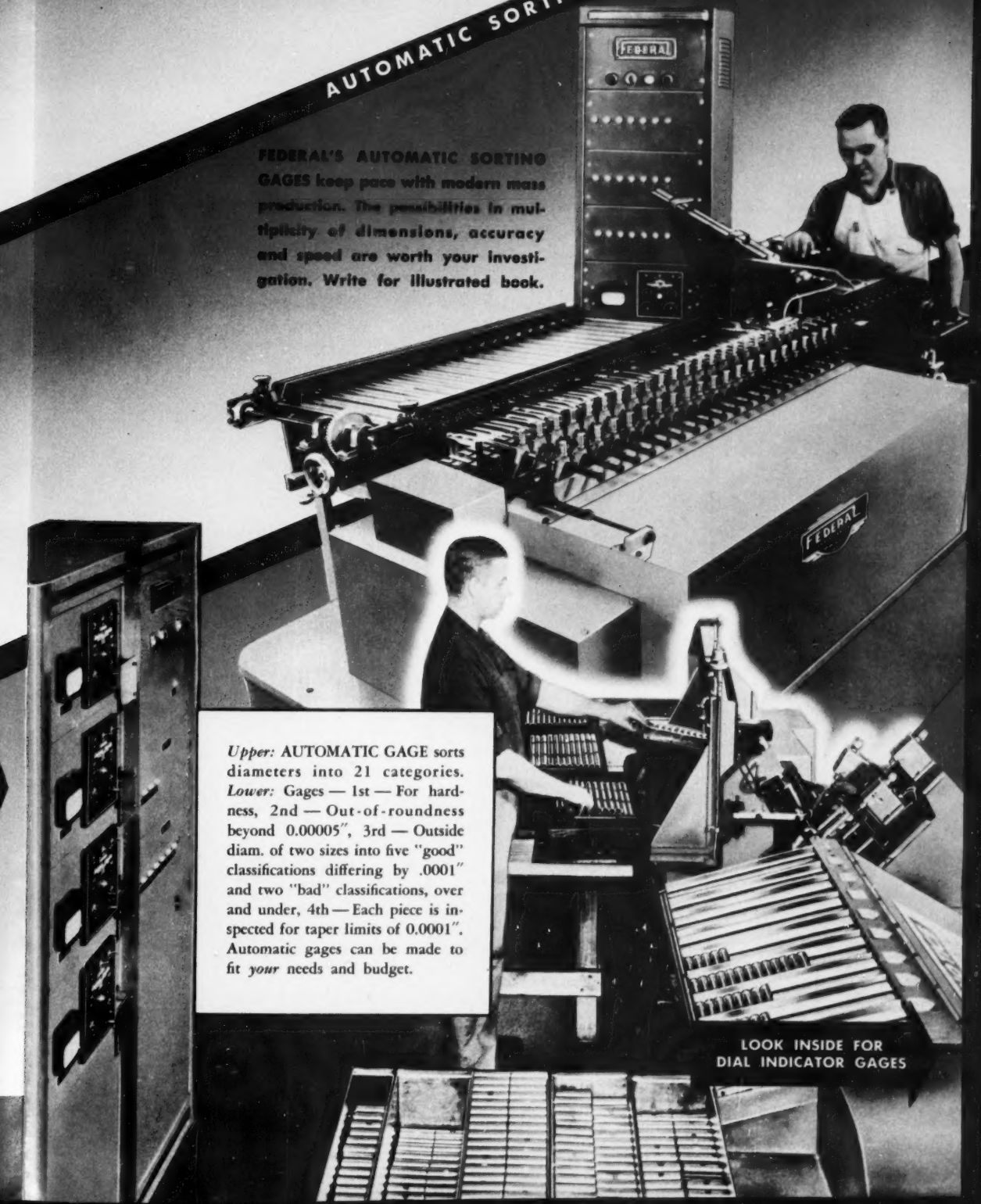
FEDERAL has *Everything* in Gages

for Dimensional Control

"AUTOMATION" The Newest Aid To Mass Production

AUTOMATIC SORTING GAGES

FEDERAL'S AUTOMATIC SORTING GAGES keep pace with modern mass production. The possibilities in multiplicity of dimensions, accuracy and speed are worth your investigation. Write for illustrated book.



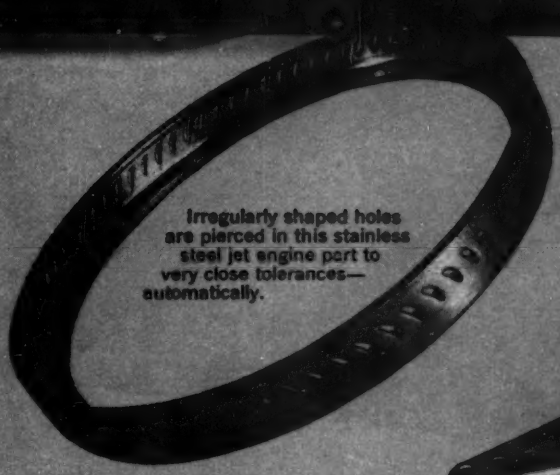
Upper: AUTOMATIC GAGE sorts diameters into 21 categories. *Lower:* Gages — 1st — For hardness, 2nd — Out-of-roundness beyond 0.00005″, 3rd — Outside diam. of two sizes into five "good" classifications differing by .0001″ and two "bad" classifications, over and under, 4th — Each piece is inspected for taper limits of 0.0001″. Automatic gages can be made to fit *your* needs and budget.

LOOK INSIDE FOR DIAL INDICATOR GAGES

verything in Gages
r Dimensional Control

FEDERAL PRODUCTS CORPORATION

1144 EDDY STREET, PROVIDENCE 1, RHODE ISLAND, U. S. A.



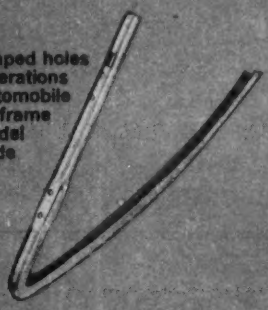
Irregularly shaped holes are pierced in this stainless steel jet engine part to very close tolerances—automatically.

More than 40 holes in this automotive frame member are pierced simultaneously.

Cylindrical parts can be pierced (or related operations) from the outside in or inside out using an indexing type machine.

High Production Piercing...

IN A SINGLE SET-UP



Seven irregular shaped holes and two trimming operations complete this automobile door inner window frame in one setup. Model changes can be made at little expense.

Based on a recent development in piercing technique, you can pierce more holes simultaneously—faster and with greater accuracy—on Danly Metalworking Equipment. Eliminate awkward multiple handling . . . pierce all holes faster in a simple, single set-up.

Built specifically for your piece part, these are only a few of the advantages of Danly Hydraulic Metalworking Equipment:

FREE

Write for this Bulletin today!

Consider these important features!

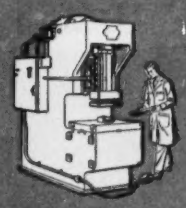
- ***HIGH CAPACITY***—Up to 225 tons available per cylinder.
- ***BREAKTHROUGH SHOCK PRACTICALLY ELIMINATED***—Permits greater capacity without hydraulic circuit or tool trouble . . . smoother, faster.
- ***AUTOMATIC STRIPPING***—An integral feature of every cylinder . . . each station hydraulically strips its punch. This unique action simplifies fixturing, is practically foolproof.
- ***ACCURACY, FLEXIBILITY***—Pierces practically any type of hole . . . round, oblong or irregular to very close tolerances.

DANLY®

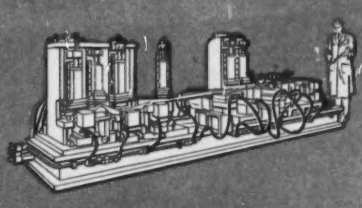
DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue • Chicago 50, Illinois

HYDRAULIC METALWORKING EQUIPMENT
MECHANICAL PRESSES 50 TO 3000 TONS

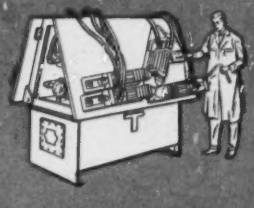
DANLY HYDRAULIC METALWORKING EQUIPMENT



General Purpose Gap Frame Piercing Press



Automotive Frame Piercing Machine



Automotive Inner Window Frame Piercing Machine

Jet Engine Shroud Ring Piercing Machine

NIAGARA Presents

outstanding design features:

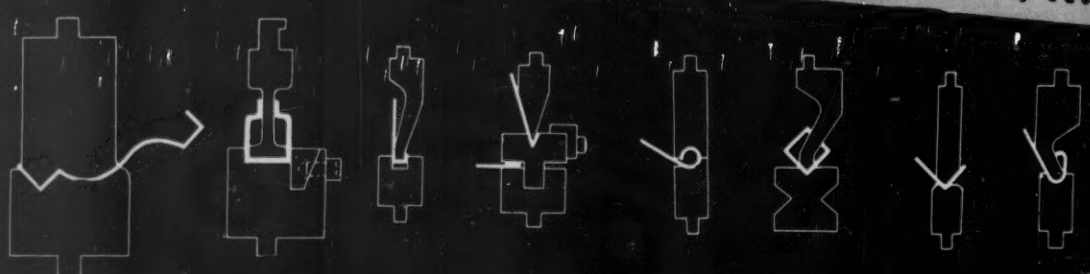
- Double End Twin Drive with double reduction gearing (for straight bends and smooth power application.)
- A rigid One-piece Frame with permanently welded crown for minimum deflection and permanent alignment.
- Laminated Non-Metallic Ways maintain accurate alignment and assure longest life of dependable service.
- Deep Twin Plate Steel Bed with open slug clearance for multiple punching work.
- Powerful Air Cooled Friction Clutch and Brake assures easy ideal "Press Brake Action".
- Air Electric Clutch Control may be operated by palm buttons on ram or foot switch with provisions for "Inching", "Single Stroking" and "Continuous Run".
- Reversible Flywheel can be pulled out of accidental stalls.
- Power Adjusted Ram with self-locking adjusting screws.
- Micrometer Dials accurately indicate position of ram so die settings can be quickly repeated.
- Accessibility at rear with plenty of clear working space for safety.
- Gages with full horizontal and vertical adjustment for front or rear of press.
- Angle Support Brackets and Bolster Plates quickly convert press for stamping operations without affecting bending ability.
- All gears operate in totally enclosed sealed baths of oil.

versatility of operations

BENDING	JOGGLING
FORMING	NOTCHING
DRAWING	PUNCHING
BEADING	PIERCING
CURLING	PERFORATING
CORRUGATING	SLITTING
BLANKING	TRIMMING
EMBOSSING	ETC.

WRITE FOR BULLETIN 89

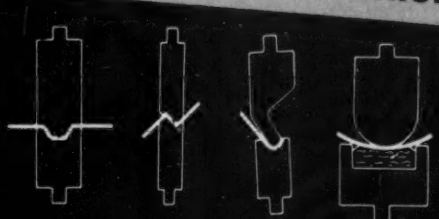
NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.



The Last Word in New All-Steel

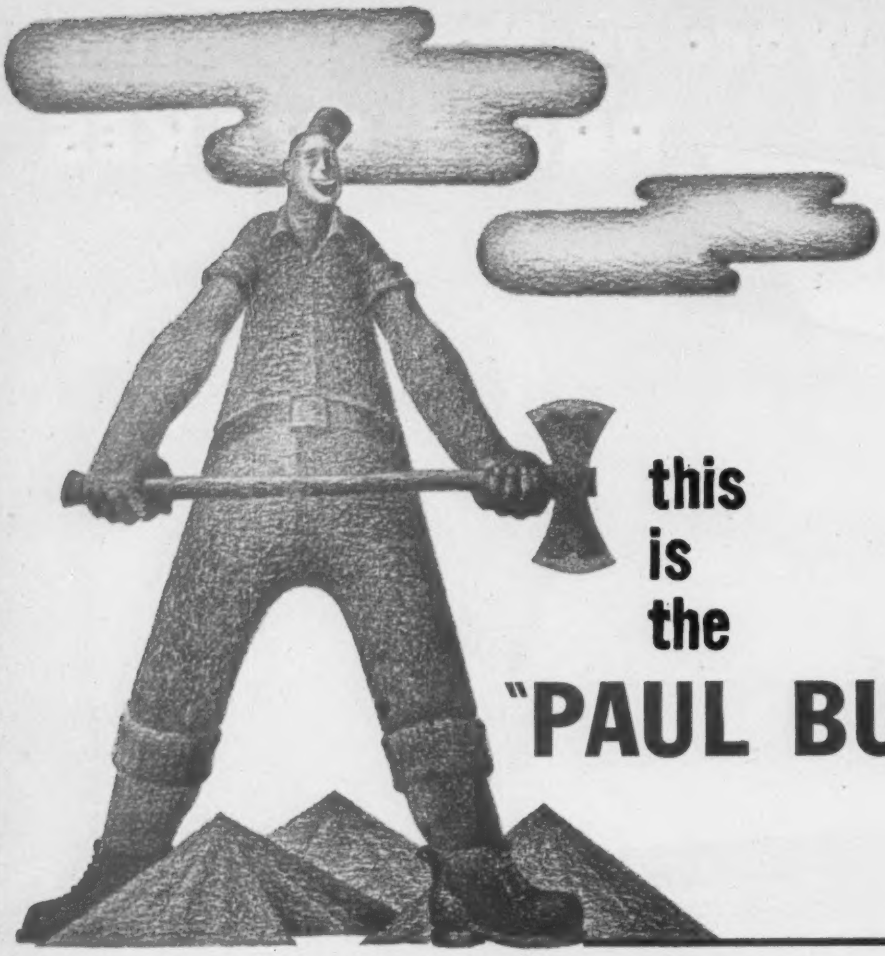
PRESS BRAKES

DISTRICT OFFICES: DETROIT, CLEVELAND, NEW YORK, PHILADELPHIA

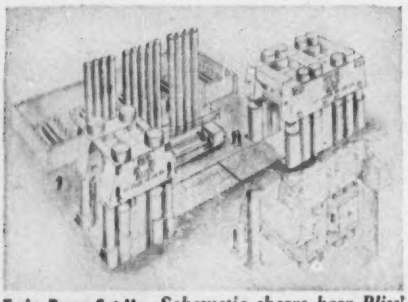


America's Most Complete Line of Presses, Shears, Machines and Tools for Sheet Metal Work

Dealers in principal U. S. cities and major foreign countries



this is the "PAUL BUNYAN"...



Twin Press Set-Up: *Schematic shows how Bliss' 35,000 and 25,000-ton presses will be installed.*

Write for the twelve-page Special Issue of the BLISS NEWS LETTER *which describes the Bliss heavy presses in detail.*

And it's in the machining stage now...

Bliss is building this press and another, its 25,000-ton teammate, for the critical USAF heavy press program—a program which promises to speed up production of the one-piece wing spars required by the stresses of sonic and near-sonic speeds.

Instead of today's time-consuming and costly machining of rough billets into single spars, these presses will allow Kaiser Aluminum to take a rough billet, give it a mighty multi-million pound squeeze and mold it into near-finished shape!

Just planning to build monster presses like these brings problems that stagger the imagination. To give you a quick idea: the size and weight of *every* major section had to be limited by the capacity of railroad rolling stock. In fact, in one case the main line of the Pennsylvania RR will have to be lowered five inches to allow under-bridge clearance for the largest of the press sections.

An unusual job in most respects, these presses nevertheless have one thing in common with *all* Bliss presses: *the same creative press engineering.* That's why Bliss, the world's largest press builder, always offers the right press—hydraulic or mechanical—for a given job, no matter what the capacity.

E. W. BLISS COMPANY, CANTON, O.

E. W. Bliss (England) Ltd., Derby, England

E. W. Bliss Company (Paris), St. Ouen sur Seine, Paris

U. S. Plants in Canton, Salem and Toledo, Ohio; and Hastings, Michigan

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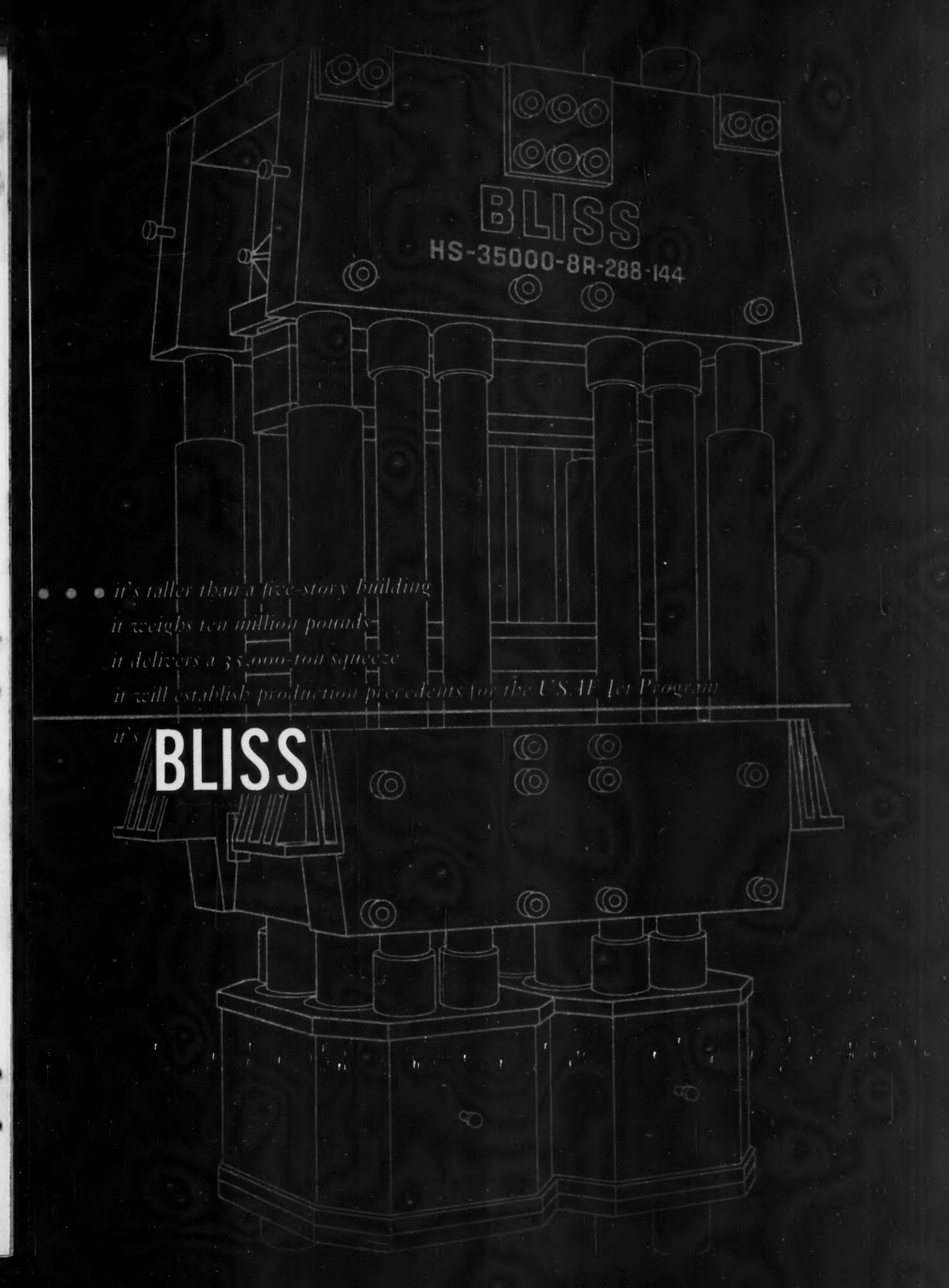
Remember: *for Presses, Rolling Mills, Special Machinery—It's* **BLISS**



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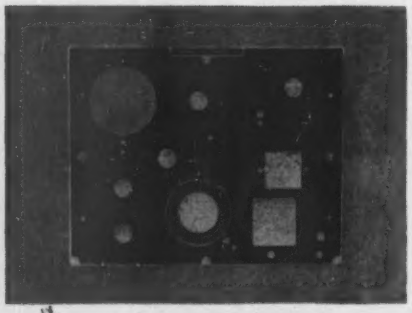

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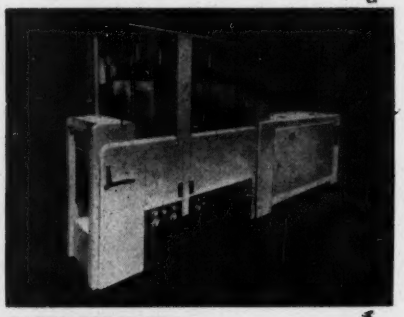

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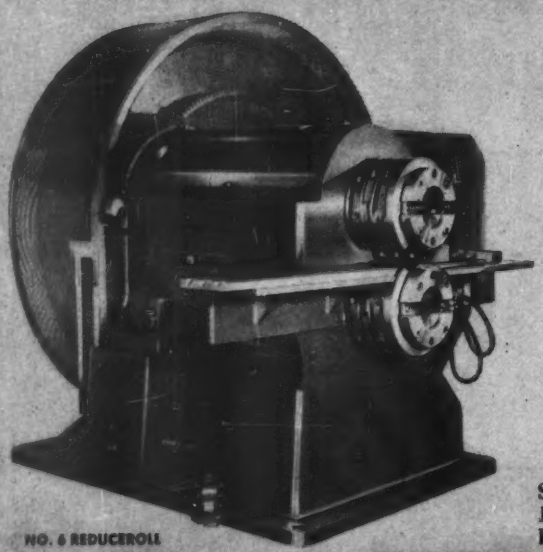
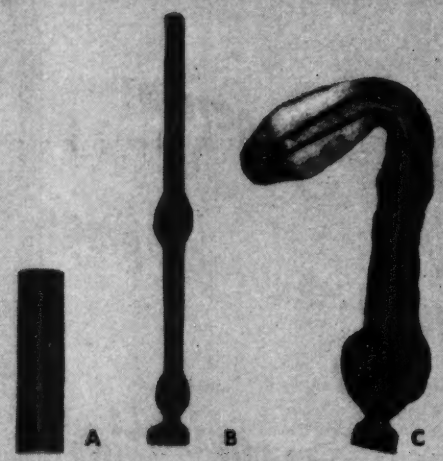


NO. 6 REDUCEROLL



Stock (A) measures 2¼" round by 8¾" long, weighs 10 lbs. REDUCEROLLED blank (B) ready for forging. Finished forging (C). Note small amount of flash.

METHOD	EQUIPMENT	CREW	FORGINGS PER 8 HOURS
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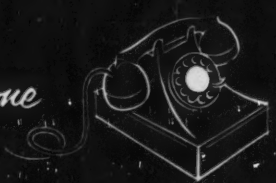

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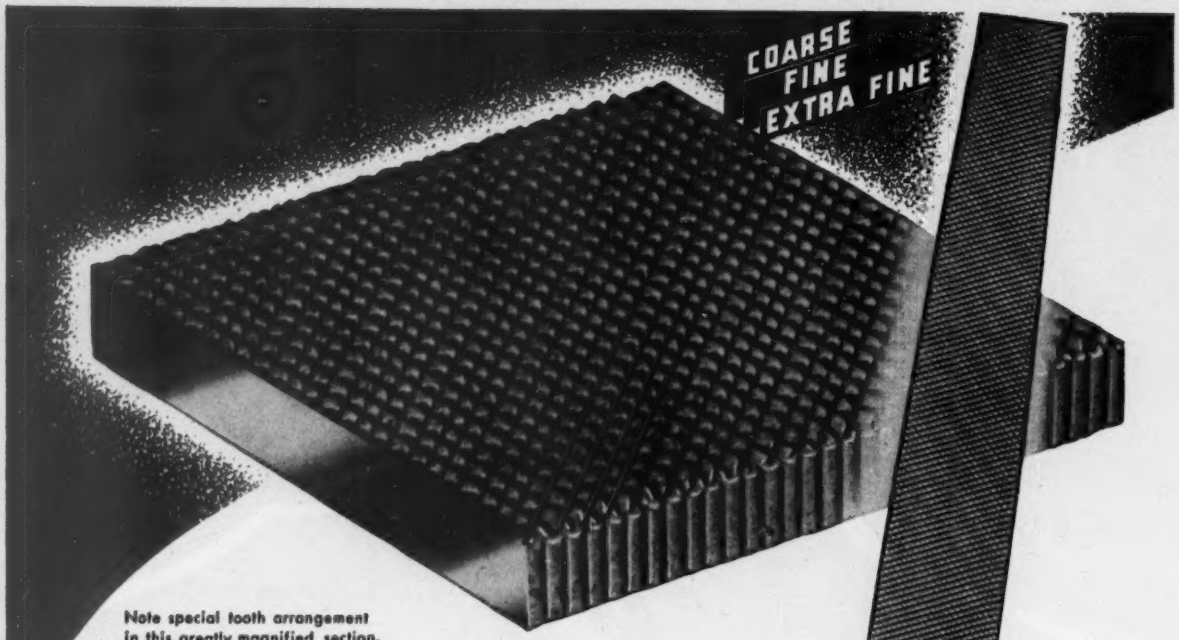

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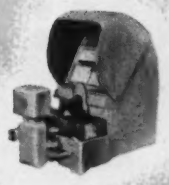

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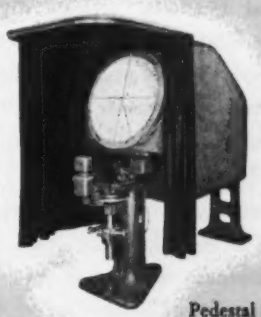

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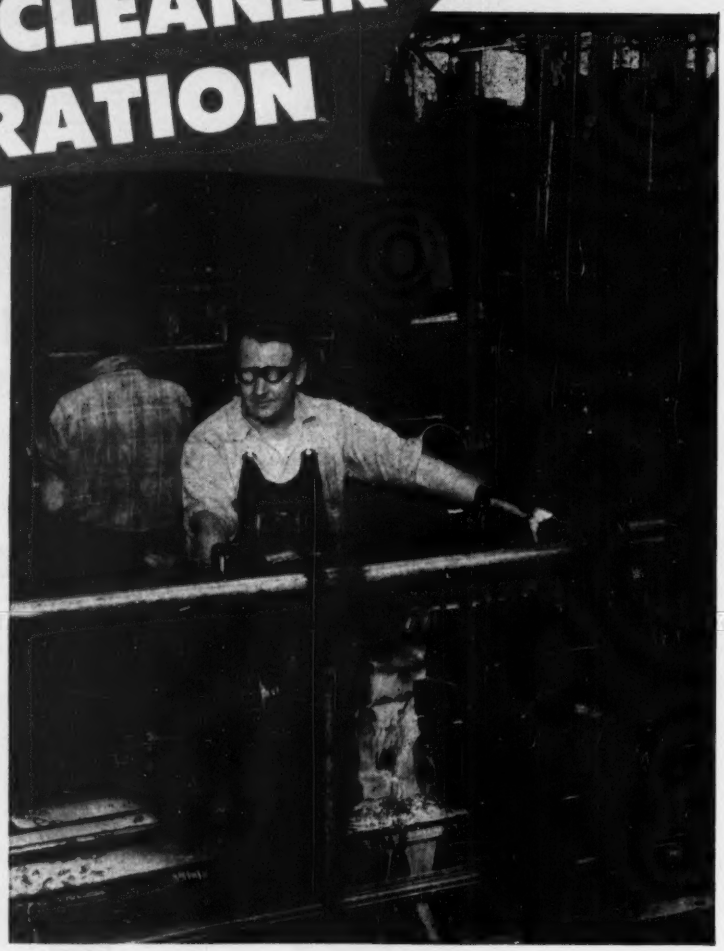

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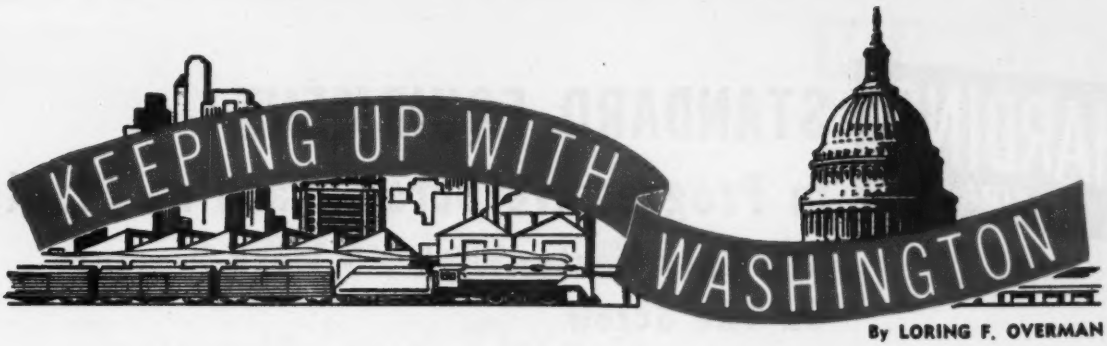

By LORING F. OVERMAN

The Administration Plans Decontrols and Reviews Past Policies

QUICK steps on the road toward more business management and less government regulation are being taken these days in Washington. Termination of price controls authority on April 30 has been conceded. In anticipation of the end of the Controlled Materials Plan on June 30 restrictions are being relaxed. Meanwhile the steel industry has presented a strong case for immediate ending of the Plan, with the possible exception of specific directives to assure emergency deliveries to the Defense Department and the Atomic Energy Commission.

Labor and the Electronic Revolution

Termination of the wage-salary controls program is expected to clear the way for labor to petition for important upward adjustments. How much power labor's drives will carry depends somewhat upon how Congress handles proposed amendments to the Taft-Hartley Act. If Congress yields to strong union pressure, as it has been known to do during the last twenty years, the pattern may be set for higher and higher labor costs.

That is where the machinery and machine tool industries come in. As one official puts it: "We are at the beginning of an electronic revolution and moving at an accelerating rate toward automatic controls and robot processes which will do man's work, and thereby counteract the rising costs curve in industry. With high break-even points and more or less inflexible hourly labor costs, it is imperative that management maintain a high volume of production. In many industries, the most effective way to reduce production costs is through further mechanization of manufacturing processes."

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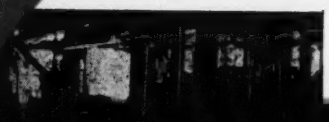

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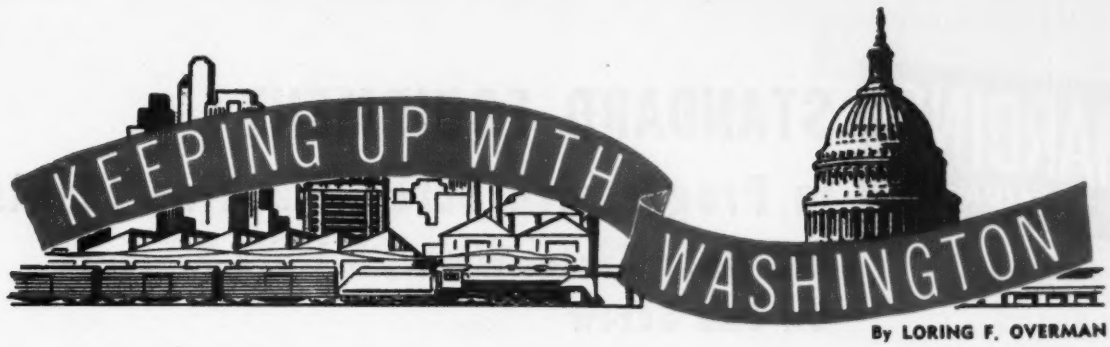

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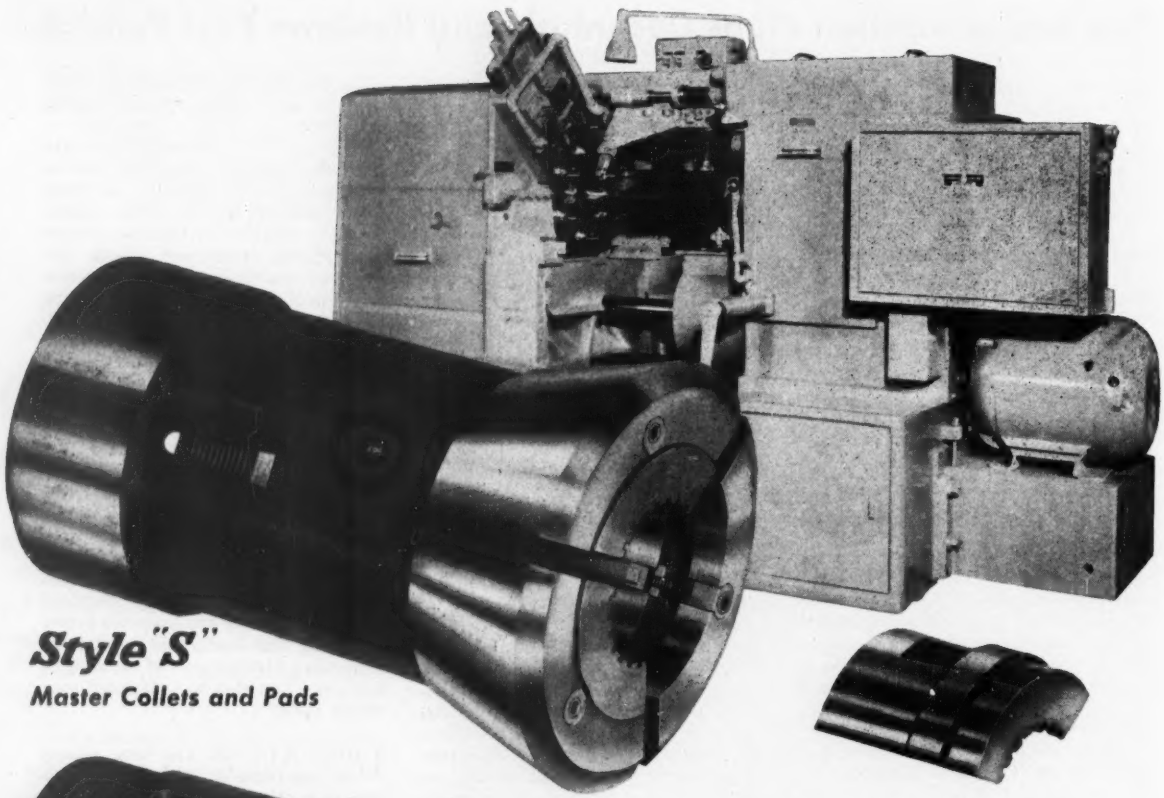

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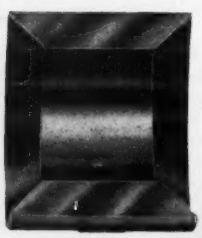

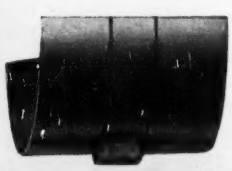

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Higher Depreciation Rates Would Insure Prosperity and Defense

SANITY is being restored to taxation in government circles. Social objectives of the New Deal philosophy that are incorporated in present tax regulations are certain to be removed in the not-too-distant future. Laws which now tend to stifle legitimate business will be changed and incentives offered to encourage manufacturing companies to attain higher levels of production.

The pleas of industry for more generous depreciation allowances on manufacturing equipment are no longer falling on deaf ears in the Department of the Treasury. Officials of the new administration recognize the importance of this problem to the entire national economy and have placed it high on the agenda of matters to receive early consideration.

Greater allowable rates of depreciation on capital goods would encourage manufacturing concerns to purchase new equipment right now, and would enable them to attain the highest planes of productive efficiency. To illustrate how strong a nation can become through modernization of its industrial plants, it is only necessary to remind ourselves of wartime Germany. Because of the depreciation policy of the German Government in pre-war years, that nation became so strong industrially it could defy practically the rest of the world. At the close of the war, bombed-out Germany still had as many machine tools in working condition as the entire United States.

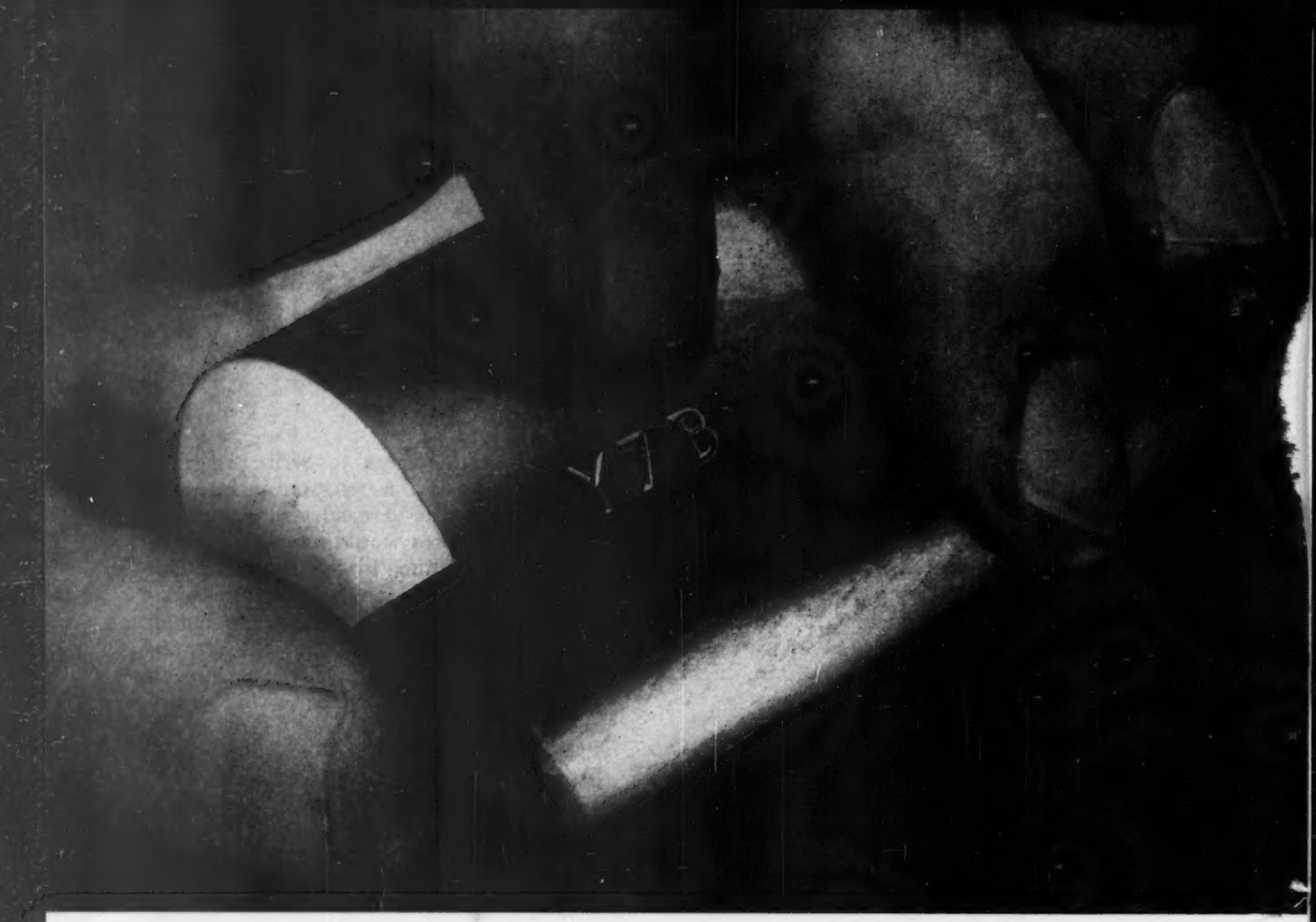
In the past, Treasury officials were unwilling to change depreciation rates to permit manufacturers to write off new equipment within a reasonable term of years. From the Treasury's viewpoint, more lenient rates would have meant less immediate income through taxes. But sight was lost of the fact that if business concerns were encouraged to install the latest types of manufacturing equipment in their factories, the resulting economies would be reflected in greater profits subject to increased taxes which would cut down the loss in income to the Government.

Another important point that obviously should have been considered was that just as soon as the new equipment had been depreciated on accounting books, the amount of income subject to taxation would have been greatly increased. In other words, the disadvantage to the Treasury would be a temporary one.

Needless to say, relaxation of present depreciation regulations would insure a high level of activity in the immediate future for the machinery manufacturing industries and, in the case of machine tool builders, would foster a virile industry. However, the important point to be remembered by government officials and members of Congress is that modernization of industry would bring substantial benefits to all walks of life. More goods could be produced at lower costs and sold at lower prices, real wages would be increased, and higher levels of industrial activity and employment would be maintained. Furthermore, the nation would be at maximum strength industrially for peace or war.

Charles O. Herb

EDITOR



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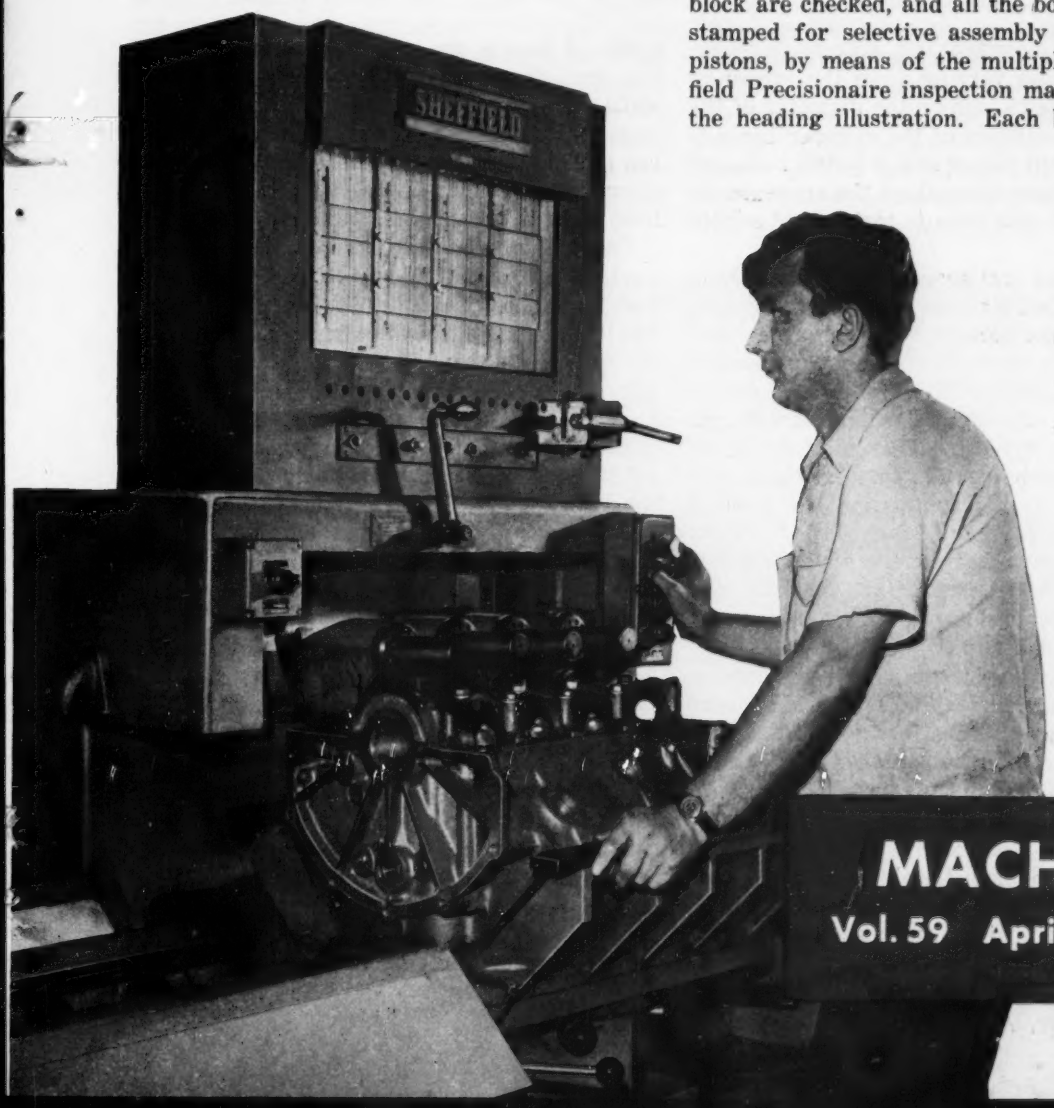
Advanced Inspection Equipment Insures Close Tolerances

CHARLES H. WICK
Associate Editor

MANY close-tolerance parts that must be assembled selectively are required for the powerful new De Soto Fire Dome V-8 engine. Although the rigid inspection requirements for such precision parts and their classification to permit selective assembly can seriously hamper mass production techniques, the De Soto Division of Chrysler Corporation, Detroit, Mich., has licked this problem by utilizing the most modern inspection equipment and methods available.

Multiple-dimension inspection and classifying machines of advanced design can be made an integral part of the production line, and permit the manufacture of high-quality, close-tolerance parts without sacrificing rapid production methods. Also, inspection costs are reduced to a minimum. Outstanding examples of such equipment employed in the plant will be described in this article.

Diameter, out-of-roundness, taper, and bell-mouth of all eight cylinder bores in the engine block are checked, and all the bores graded and stamped for selective assembly with matching pistons, by means of the multiple-column Sheffield Precisionaire inspection machine shown in the heading illustration. Each bore is marked



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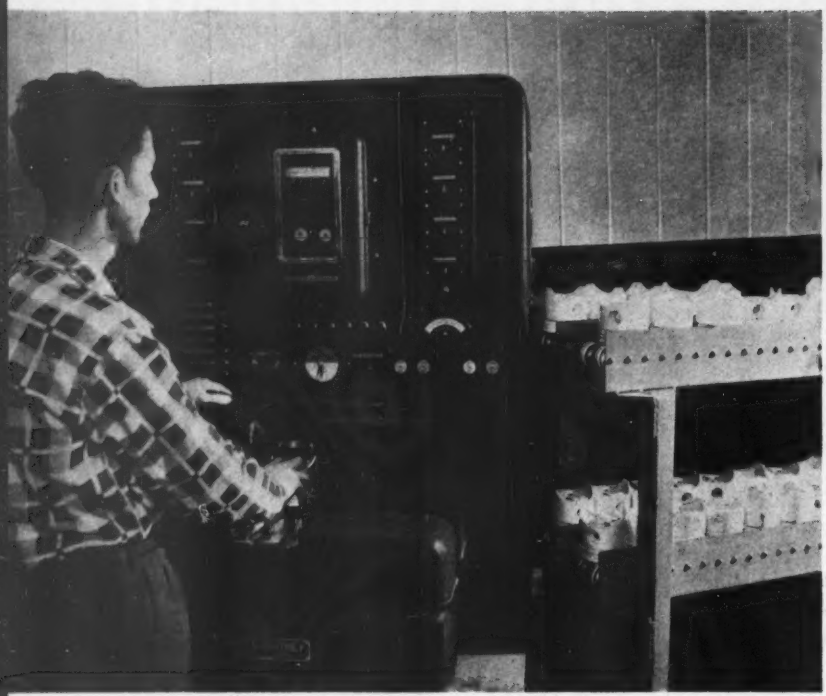


Fig. 1. This combination Electrolimit and Air-O-Limit gage is used for inspecting the diameters of the piston ring grooves, ring land, and wrist-pin hole; groove widths; and skirt diameter and taper.

with one of ten classifications, successive classifications or grades varying from the preceding one by only 0.00025 inch on the diameter of the bore. Out-of-roundness of the cylinder bores is maintained within plus or minus 0.0005 inch, and the maximum taper throughout the approximate 6-inch depth of each bore is maintained within 0.001 inch.

Cylinder bores are inspected after they have been honed to final size and washed. The engine blocks slide to the bore inspection machine on a gravity roller conveyor. Translucent, illuminated screens, located behind the conveyor and one on each side of the inspection machine, throw light up through the cylinder bores so that the inspector can see whether the bores are scored or pitted. After visually inspecting one bank of four cylinder bores, the operator slides the block onto the indexing fixture at the gaging station. Accurate location of the block is obtained with hydraulically operated shot-pins that enter previously machined holes in the block.

When the starting button is pushed, four angularly mounted gaging spindles are raised, each spindle entering one bore in the block. If any spindle fails to enter a bore due to incorrect spacing or under size of the bore, the machine will automatically become inoperative. Every gaging spindle has four cylindrical plugs that contain two diametrically opposed orifices through which air is ejected onto the cylinder bore walls. Each pair of orifices is connected to one of sixteen vertical, transparent indicator tubes. A float in the tube rises or falls, depending upon the distance from the orifices to the walls of the cylinder bores, and, since a calibrated scale is provided beside each tube, the inspector can quickly determine whether or not the bores meet specifications and the classifications of the four bores in one bank.

The sixteen tubes are grouped into four sets, a set of four being employed to inspect a cylinder bore on either side of the V-8 engine block. The left-hand tubes in the sets carry air ejected from the orifices in the lowest plug on each gaging spindle, and successive tubes carry the air ejected from the next higher plug. Thus, the inspector can note the taper in the bore by observing the relative positions of the floats in a set of tubes. Out-of-roundness is inspected by noting the movement of the floats when the gaging spindles are rotated through an angle of 180 degrees. This is accomplished by manually rotating a crank-handle.

Classification of the bores is based on the location of the float in the right-hand tube of a set, which corresponds to the diameter of the bore at the uppermost point of piston travel. The grade of the bore is stamped on the block by means of manual marking devices, the device being located above each gaging spindle. After completing the inspection of one bank of four bores, the gaging spindles are lowered, the engine block is swung through an angle of 180 degrees, the spindles are raised into the remaining four bores, and the inspection cycle is re-

peated. All eight bores in each engine block are inspected, graded, and stamped in approximately one minute.

To insure accurate selective assembly of the aluminum-alloy pistons in the graded cylinder bores of the engine blocks, the pistons are inspected in an air-conditioned room (maintained at a temperature of 72 degrees F.) by means of the Pratt & Whitney multiple-station combination Electrolimit and Air-O-Limit inspection machine, Fig. 1. Included in the automatic cycle is the inspection of the diameter and width of the three ring grooves, the wrist-pin hole diameter, the diameter of the top land, the taper of the piston skirt, and the diameter of the piston at a point just below the third ring groove. As is done with the cylinder bores in the engine block, the pistons are marked with one of ten classifications (plus over size or under size), each classification varying from the next by 0.00025 inch on the diameter of the piston. Inspection of all these dimensions and grading of the pistons are completed at the rate of over 560 per hour.

The skirt on the piston is checked by two pairs of floating Electrolimit gages that contact the skirt at its top and bottom. The taper, from top to bottom of the skirt, is indicated on a calibrated meter. The electrical system automatically determines the size from the taper and diameter of the skirt, so that the operator need not make any calculations. The grade (size) is automatically indicated by dial and light, and marked in ink on the head of the piston.

Diameters of the top land and three ring grooves on the piston are also checked with floating electrical contact units. Groove widths, held to a tolerance of 0.001 inch, are inspected with blade type, Air-O-Limit plug gages having integral nozzles. The diameters of the wrist-pin holes in both bosses of the piston are checked with an air plug gage over which the piston is slipped when mounting it in the inspection machine. Since the piston cannot be rotated in this set-up, the average diameter of each hole is checked by means of six nozzles spaced equally around the periphery of the plug gage. Wrist-pin hole diameters have a limit of 0.0003 inch.

The average diameter of the wrist-pin hole in each boss of the piston is indicated on a meter. Signal lamps are illuminated for the diameter and the width of the ring grooves, and diameter of the ring land. A set of red lights indicates parts that are under size, and one of green indicates that the dimensions are within tolerance. Each inspected piston is placed in one of ten gravity chutes leading to the area in which the connecting-rods and wrist-pins are assembled to the pistons, as seen in Fig. 2. The selection of the chute depends upon the classification (piston diameter) stamped on the piston.

All five main-bearing diameters and the oil-seal diameter of the V-8 engine crankshaft are checked (prior to polishing of the bearing surfaces) on the seventeen-column Sheffield Precisionaire inspection machine shown in Fig. 3. The five main-bearing gaging heads each have

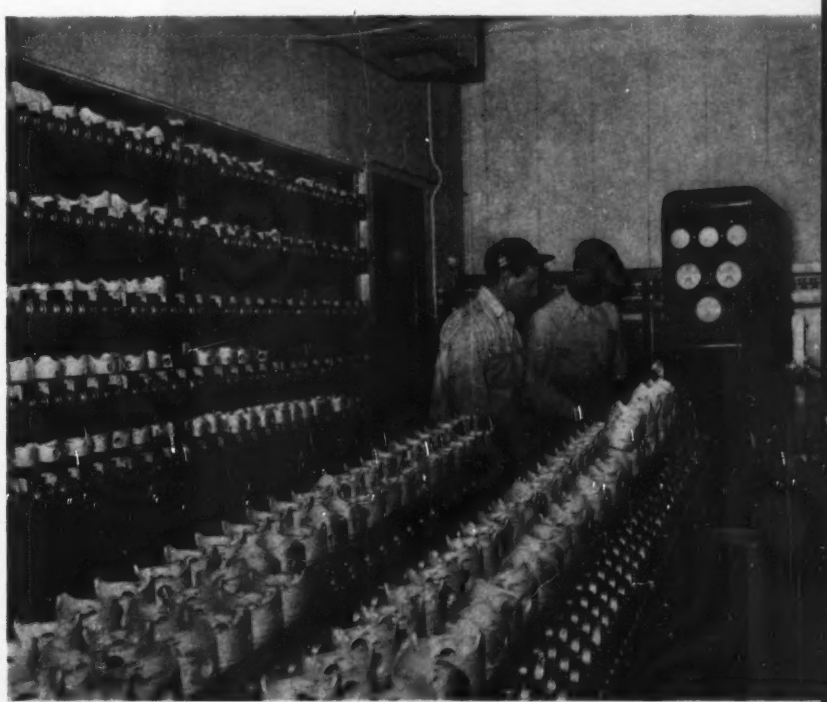


Fig. 2. Inspected pistons are put in gravity chutes (of the indicated classification) leading to the area in which connecting-rods and wrist-pins are assembled.

Fig. 3. A seventeen-column Precisionaire gage is employed to check the diameters of the five main bearings and oil-seal surface on the crankshaft.

three pairs of air jets, located diametrically opposite and spaced so that the main-bearing diameter is inspected at opposite ends and midway between the flanges. By observing the location of the float in the vertical column to which each pair of air jets is connected, the diameter and the shape of the bearing are inspected.

When the crankshaft is rotated, the relative position of the floats in each group of three columns is observed to insure that the bearing surfaces are not out-of-round, tapered, or of hourglass shape. A total tolerance of 0.0005 inch is maintained on the five main-bearing diameters, while plus or minus 0.001 inch is held on the oil-seal diameter.

After removing about 0.0002 inch of stock from the bearing surfaces during polishing, the crankshafts are reinspected on a Precisionaire gage containing twenty-two columns. In addition to rechecking the five main-bearing diameters, this machine gages each of the four crankpin bearings at three positions. Crankshafts are checked at the rate of sixty per hour on one inspection machine.

Completely machined connecting-rod assemblies are given a final inspection, and are graded with respect to the wrist-pin bushing diameter, by means of the Pratt & Whitney Air-O-Limit inspection machine shown in Fig. 4. In the first set-up on this machine, the connecting-rod assembly is placed with its crank end bore over the upper air gaging spindle and against a left-hand locating disc, and the bushing bore on the wrist-pin end over the lower air gaging spindle. Both the upper and lower spindles have six air ejection orifices for indicating an average diameter of the two bores being inspected.

The diameter of the bushing bore in the wrist-pin end of the connecting-rod assembly has a total tolerance of only 0.0003 inch (indicated on the left-hand dial), and is graded in one of three classifications. The grade of the bushing bore is indicated by the automatic illumination of one

Fig. 4. Connecting-rod assemblies are completely inspected and their wrist-pin bushing bores are graded on this Air-O-Limit gaging machine.

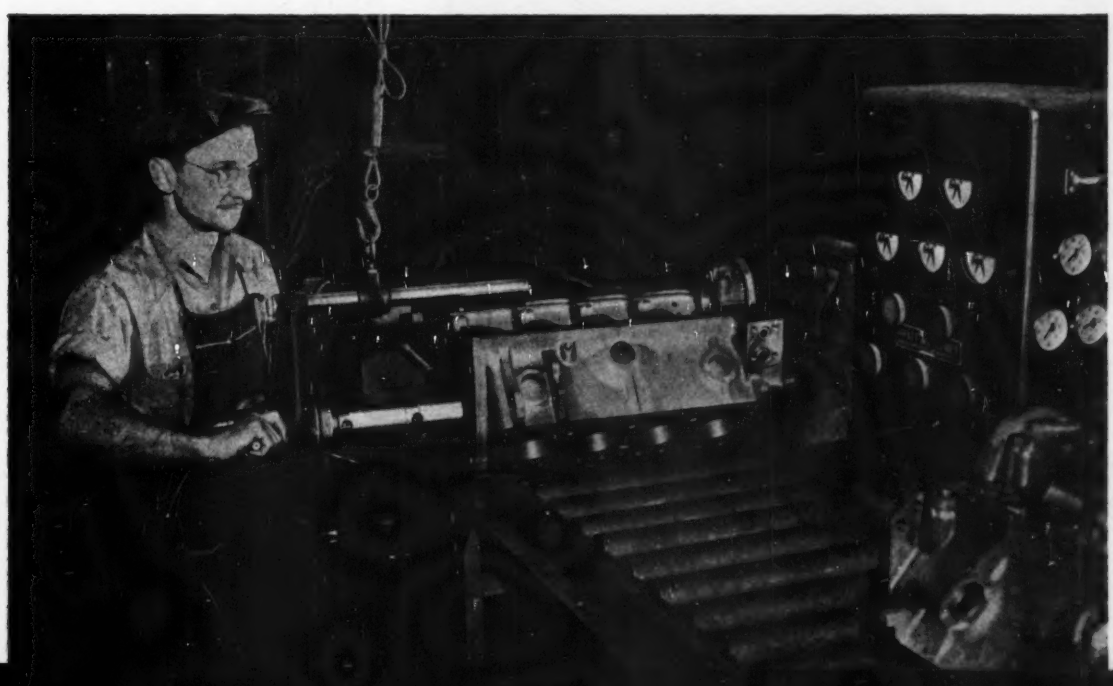
Fig. 5. All of the critical dimensions on the camshaft and the run-out of the oil-pump drive gear are inspected in one multiple gaging set-up.

of four signal lamps (one light indicating that the bore is either over or under size), and the grade is etched on the wrist-pin end of the rod by one of three electrically operated etching fingers located below the bushing air gaging spindle. The indicating dial (second from the left) shows the diameter of the crank end bore, which has a tolerance of 0.0005 inch.

For the second set-up on this machine, the wrist-pin end of the rod is slipped off the lower gaging plug, as shown, and a right-hand, air-actuated clamping ram having three contact buttons on its face is brought into contact with the crank end of the rod. An air orifice in the right-hand end of the upper gaging plug checks the rod width at the crank end within plus or minus 0.001 inch. Squareness of the bore with relation to one face on the crank end of the rod, maintained within plus or minus 0.0002 inch, is inspected by means of two air orifices 180 degrees apart. Parallelism of the two faces on the crank end of the rod is held to 0.0002 inch, and inspected by air gaging elements.

Complete and practically simultaneous gaging of most of the critical dimensions on the V-8 engine camshaft is accomplished by means of the Sheffield multiple-column, Precisionaire inspection machine seen in Fig. 5. The diameters of all main bearings and the gear diameter are checked with U-shaped "Air-Snap" blocks in which the

Fig. 6. Air-O-Limit gage having five pairs of diametrically opposed air orifices employed to check bores of camshaft bearing bores.



camshaft rests. These snap type blocks each have a pair of two diametrically opposed air orifices that are connected to the two five-column, one three-column, and one two-column gaging units. The shaft is revolved manually for checking out-of-roundness as well as concentricity of the surfaces. The gage will not indicate bearing sizes if the shaft is not within straightness tolerance. Run-out of the oil-pump drive gear on the camshaft is inspected by meshing it with a mating gear that is mounted on a slide and connected to a dial-indicating gage on the inspection machine.

Inside diameters of the five camshaft bearing bores in the V-8 engine block are inspected by means of Pratt & Whitney Air-O-Limit gages such as the one shown in Fig. 6. The gage is suspended from an overhead counterbalance, and has a long spindle with five pairs of diametrically opposed air orifices properly spaced along its length to measure the five diameters simultaneously. When the gaging spindle has been inserted in the block, the inspector can quickly read the size of each bore on individual dial indicators. The indicators are mounted on the compressed air supply cabinet seen at the right. A spring-loaded stop-ring locates the gaging spindle with relation to the end face of the engine block.

Similar gages are employed at three different locations along the production line for inspecting the camshaft bearing bores in the cylinder block, and then the same bores after the babbitt-lined bushings are pressed into place and machined. A tolerance of plus or minus 0.0005 inch is maintained on these bore diameters. Another gage of the same type is used to check the diameter, out-of-roundness, taper, and alignment of the five main-bearing crank bores in the engine block.

An unusually effective checking method is the testing of exhaust valve and spring assemblies for proper assembly of the intake valve stem oil seal within the valve spring retainer. This is accomplished by means of the Arlin Products inspection machine shown in Fig. 7. Compressed air is introduced on the top of the spring retainer and valve assembly. Pressure losses through the sealing surface are indicated on electronic dial gages. If leakage exceeds the specified amount, the bad assembly is identified by an ink mark sprayed on the valve retainer of that assembly. Also, a signal lamp is illuminated. The operator then removes the defective assembly, and it is sent to a re-work department for repairs.

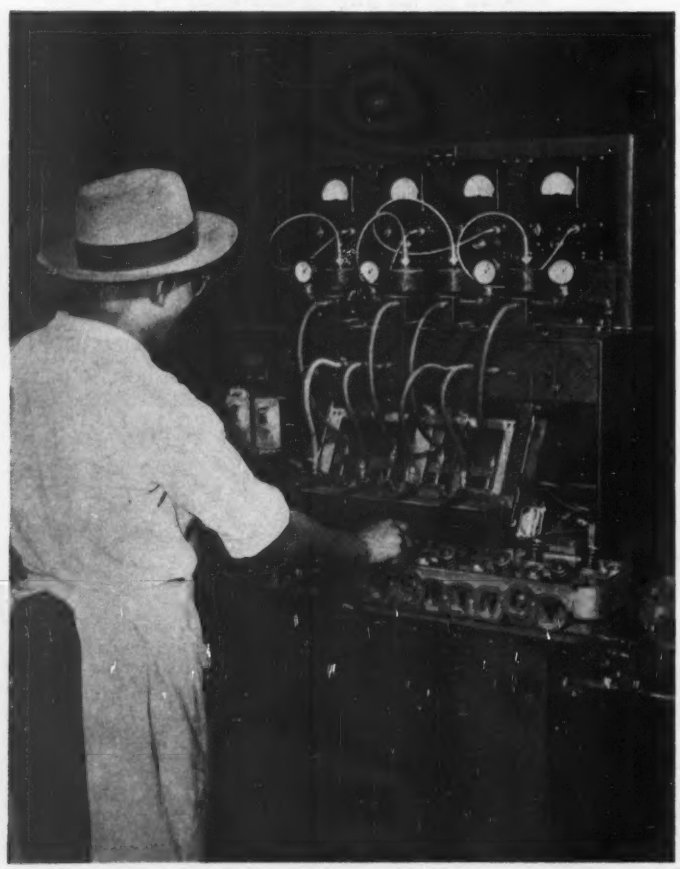


Fig. 7. Leakage in exhaust valve and spring assemblies in the cylinder head is determined by compressed air and electronic gages.

Carbon Dioxide Permits Improved Machining Time

Cutting speeds and feeds employed in contour-machining heat-resisting steel-alloy parts for aircraft jet engines have been increased 100 per cent by using liquid carbon dioxide to absorb the heat generated in such operations

By E. W. BARTLE
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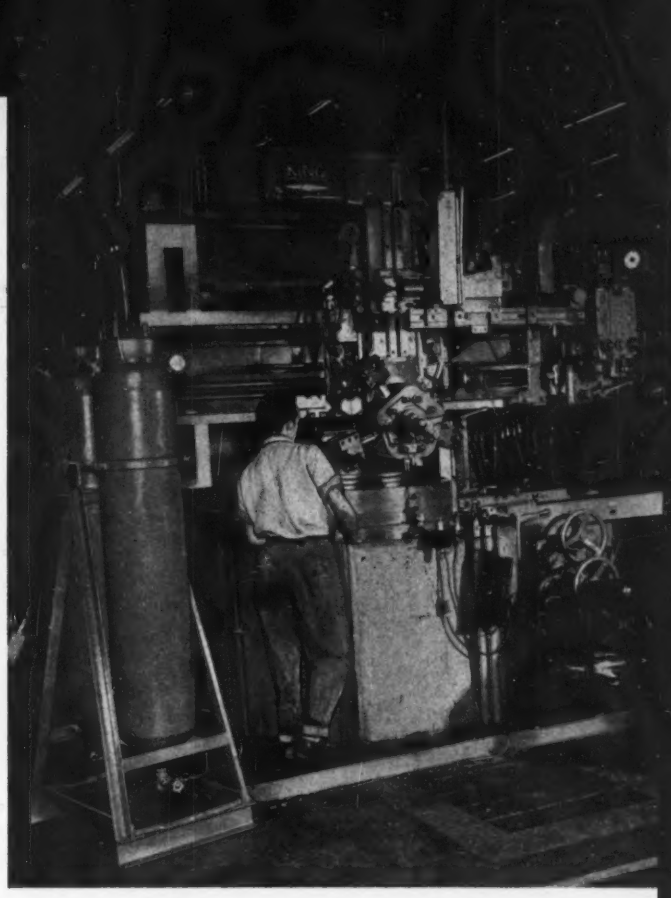


OUTER casings and inner cones for the turbine nozzle boxes of aircraft jet engines are made from a high-nickel, high-chromium, tungsten steel alloy that is difficult to machine, particularly at high speeds and feeds. In machining such heat-resisting parts at the Malton, Ontario, plant of A. V. Roe Canada Limited, the cutting speeds and feeds have been increased as much as 100 per cent by employing liquid carbon dioxide to absorb the heat that is generated.

As shown at the left in the heading illustration, tanks (converters) are used for the production of liquid carbon dioxide from dry ice (solidified carbon dioxide). These tanks are charged with approximately 150 to 175 pounds of dry ice and sealed. After the tanks have been allowed to stand at room temperature for about twenty-four hours, the solidified carbon dioxide has been converted to a liquid having a pressure between 850 and 900 pounds per square inch, and is ready for use.

Each tank is equipped with a bag containing a drying agent, located at the bottom of the tank. It serves to remove any moisture which possibly may have been absorbed by the dry ice. Each bag has a dry weight of 5 pounds and, when it becomes saturated and reaches a weight of 11 pounds, must be renewed. Replacement of the bag will normally be necessary when the tanks have been charged about twenty-five times.

Tanks are connected in pairs through a manifold so that one tank may be used at a time. When the liquid is exhausted in the first tank, a valve is closed and the second tank is brought into use. A valve is opened in the top of the first tank to allow surplus gas to escape, and then a filler cap is removed so that this tank can be recharged. Particular attention must be paid to the gasket on the filler cap in order to be certain of obtaining a perfect seal.

It is necessary that the tanks be kept closed at all times, to keep out any moisture from the atmosphere. After charging, the tanks can be tested for leaks by passing a flame around the top of the tank. When charged and stored, the tanks will retain their pressure indefinitely. The tanks require recharging when liquid carbon dioxide fails to appear at the orifice of the nozzle which is employed to spray the cutting tool. This may be ascertained by holding a piece of metal in front of the nozzle. If the metal does not become frosted, the tank requires recharging.

Connections are made from tank to nozzle through a series of valves and double-strength tubing. The valves and tubing are constructed of copper, brass, or stainless steel to prevent corrosion. Also, these parts must have a constant bore size, or else decrease in diameter from tank to nozzle, to prevent any expansion of the liquid carbon dioxide. Chamois filters are used at all joints to remove any impurities which may be present, and to prevent the nozzle from becoming clogged.

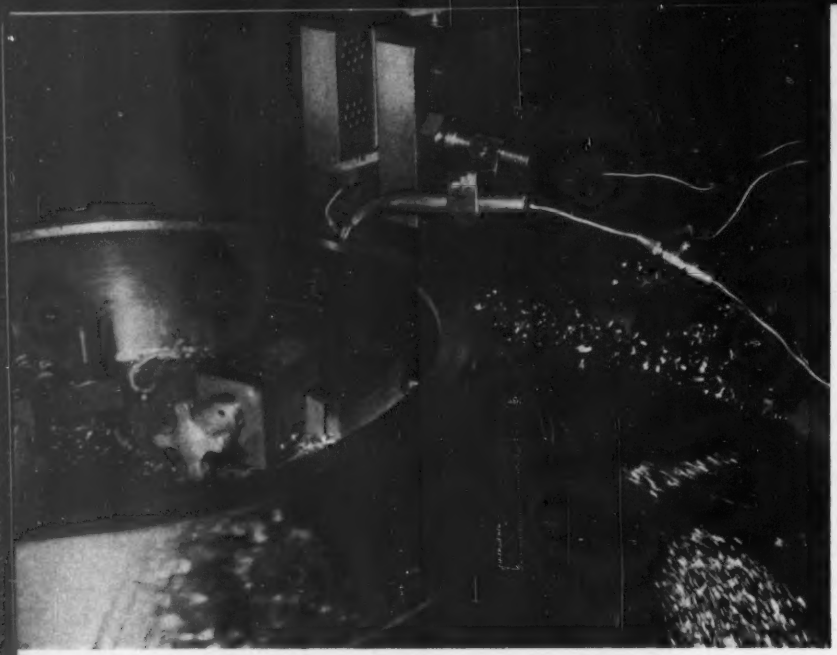


Fig. 1. Fine nozzles having openings only 0.009 to 0.015 inch in diameter are held 3/8 to 1/2 inch from the cutting tool in applying liquid carbon dioxide to absorb the heat generated.

In the set-up shown in the heading illustration and in Figs. 1 and 2, the inner cone of a turbine nozzle box for an aircraft jet engine is rough-turned, rough-bored, and rough-faced on a vertical boring mill equipped with a contouring attachment. The work, made from a high-nickel, high-chromium, tungsten steel alloy, is rotated at a cutting speed of 315 surface feet per minute, and the tungsten-carbide-tipped tools are fed at the rate of 0.020 inch per revolution. Both the speed and feed are more than twice those previously employed in machining this tough, heat-resisting steel alloy.

The liquid carbon dioxide is applied to the cutting edge of the tool through a very fine nozzle, as shown in Fig. 1. A nozzle having an inside diameter of only 0.009 inch is employed for small tools, one having a bore of 0.012 inch in diameter for medium tools, and another of 0.015 inch for large tools. The nozzles are located 3/8 to 1/2 inch from the cutting edge of the tool, and are rigidly fixed so that they cannot be displaced by chips. Upon contact with the metal, the liquid changes to carbon dioxide snow, which quickly evaporates without leaving residue. A constant supply of coolant is maintained on the tool point by means of a solenoid-operated reducing valve. Another valve is provided to conserve the coolant by shutting off the supply as soon as the cut is completed.

It has been found that when liquid carbon dioxide is employed as the coolant, particular attention must be given to the grade of carbide employed, as well as the angles ground on the tool. For example, it was found necessary to regrind the cutting tool originally employed for the operation just described, since the clearance angles were insufficient and caused the tool to drag and overheat. A chip breaker also had to be provided before these results were obtained.

Finish-turning, facing, and boring of the outer casing for the turbine nozzle box is performed on a Bullard Man-Au-Trol vertical boring mill. With the machine equipped for liquid carbon dioxide cooling of the tungsten-carbide tools, a cutting speed of 225 feet per minute and a feed of 0.015 inch per revolution are employed—about twice the speed and feed previously required for this operation. Even higher speeds could be employed if a variable-speed drive were available. In this case, it was possible to use the tools as originally ground.

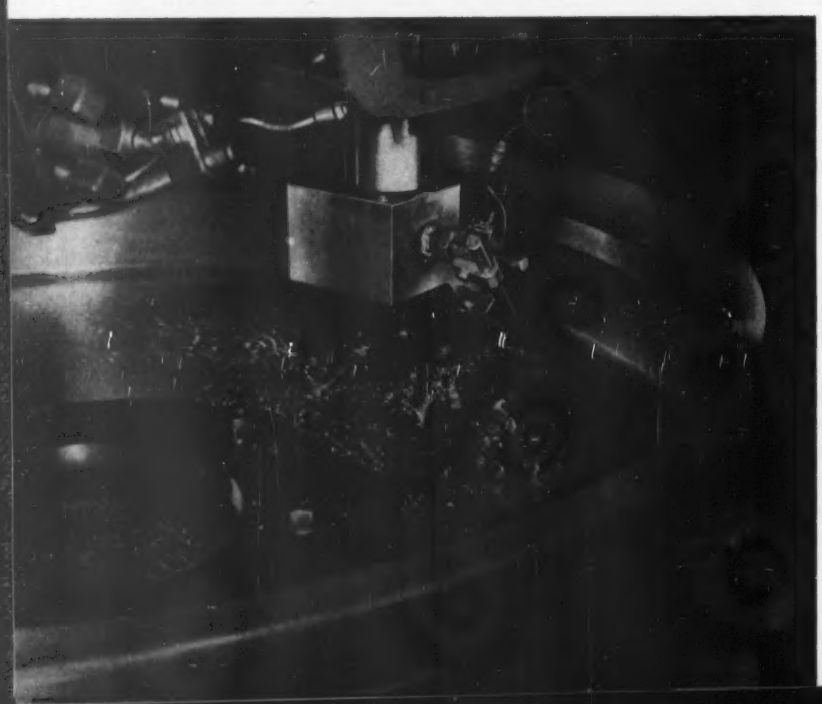


Fig. 2. Rough-boring of the inner cone for a turbine nozzle box is performed at a cutting speed of 315 feet per minute by using carbon dioxide coolant.

Tungsten-Carbide Shell Cores

By EDGAR ALTHOLZ, Associate Editor

HIGHLY classified details have just been released about a materiel problem that originated on the battlefields of World War II. Brigadier General Paul M. Seleen, Commanding General of the Detroit Ordnance District, has disclosed how an unusual and spectacular application of tungsten carbide figured decisively in stopping German "Tiger" tanks.

On "D Day plus 30" in July, 1944, the United States Army Ordnance Department received a top-secret communiqué from the Allied Commander, General Dwight D. Eisenhower, which stated tersely that the Allied advance was being seriously slowed down by the "Tiger" tanks, with their thick and seemingly indestructible armor plate. The Allied offensive was in peril of being stalemated without an anti-tank shell capable of penetrating this armor.

Ordnance had been working on a revolutionary shell, but at the time the communiqué was received, even the initial trials of the shell were far from complete. These shells, which could be fired from standard artillery pieces, consisted of a sharp-pointed aluminum case, in the center of which was a solid bullet-shaped core of tungsten carbide. The four components of the shell appear in the heading illustration. From left to right are the windshield, nose-piece, core, and body. A cavity in the body contains the core. The large and small threaded diameters of the nose-piece engage, respectively, internally threaded sections of the body and the windshield.

Steel shells had been leaving at best only an appreciable dent in the skin of the "Tiger" before glancing off. It was theorized that the point of the aluminum case of the new shell would fuse to the armor plate upon contact and rip apart, and that momentum would carry the tungsten-carbide core through the plate into the tank, where it would ricochet and disintegrate into death-dealing pellets.

At the request of the Ordnance Department, the Carboloy Co., Detroit, Mich. (now the Carboloy Department of the General Electric Co.), virtually overnight went into pilot production of the new shell cores. When shortly thereafter the first few cores were tested at the Aberdeen, Md., Proving Grounds, the answer to the German "Tigers" had been found—firing at even a 20-degree angle, the shell cores penetrated armor of equivalent thickness.

In less than two weeks, full production was under way. As fast as the shells were assembled, they were loaded on cargo planes and flown straight to the front. Once in France, they were "loaded" again, this time by Allied anti-tank crews at St. Lo. The magic cutting material of the century, a German development of the 1920's, had returned to the Fatherland in a rather unexpected fashion!

Fig. 1. A precise amount of tungsten-carbide and cobalt powder is metered out on the scale to the worker's right, then poured into a cylindrical core mold.

The Carboloy Department today is in full production of the tungsten-carbide cores for anti-tank warfare in Korea. The aluminum base, nosepiece, and windshield are being supplied by a subcontractor. In addition, an imposing stockpile of the new shells is accumulating for possible future needs. The process for making the shell cores has been set up as a distinct operation in a separate building, where the basic technology of sintered carbide manufacture has been adapted to specialized production-line techniques.

Tungsten carbide and cobalt are prepared for two parallel production lines by being carefully weighed and mixed together in the proper proportion. The mixture is ball-milled until it has been ground to the consistency of a fine powder. A subsequent addition of paraffin acts as a pressing lubricant, enabling the cores to retain their shape after being molded.

For quality control, the cores are processed from five-barrel batches of the raw material. Shrinkage of each batch varies slightly, the amount being recorded; then a check core is sintered from each batch.

At the first station of each production line, a worker meters out an exact amount of the powder and compacts it to a cylindrical shape. Figs. 1 and 2 show this operation. The net weight of 8 pounds for the core of a 76-millimeter anti-tank shell requires slightly over 10 pounds of raw material. In Fig. 1, the worker, having measured the material on the scale to his right, is pouring it into the core mold set up on an Elmes hydraulic press.

A carbide-tipped plunger operating under a pressure of 60 tons compresses the tungsten carbide and cobalt powder to a 2 1/2-inch diameter cylinder approximately 8 1/2 inches long. Pressure is applied for thirteen seconds, after which the compacted core is removed by inverting the mold on its bracket, then positioning a steel yoke over the mold, and executing a short press stroke. Next the worker extracts the core, Fig. 2.

Paraffin, which has served its purpose as a pressing lubricant, must be removed in a pre-sintering operation. "Boats" made of graphite, 30 inches long, 12 inches wide, and 4 inches

Fig. 2. After the core is compacted, the mold is inverted and released by a short stroke of the press. The worker is shown extracting the core from the mold.

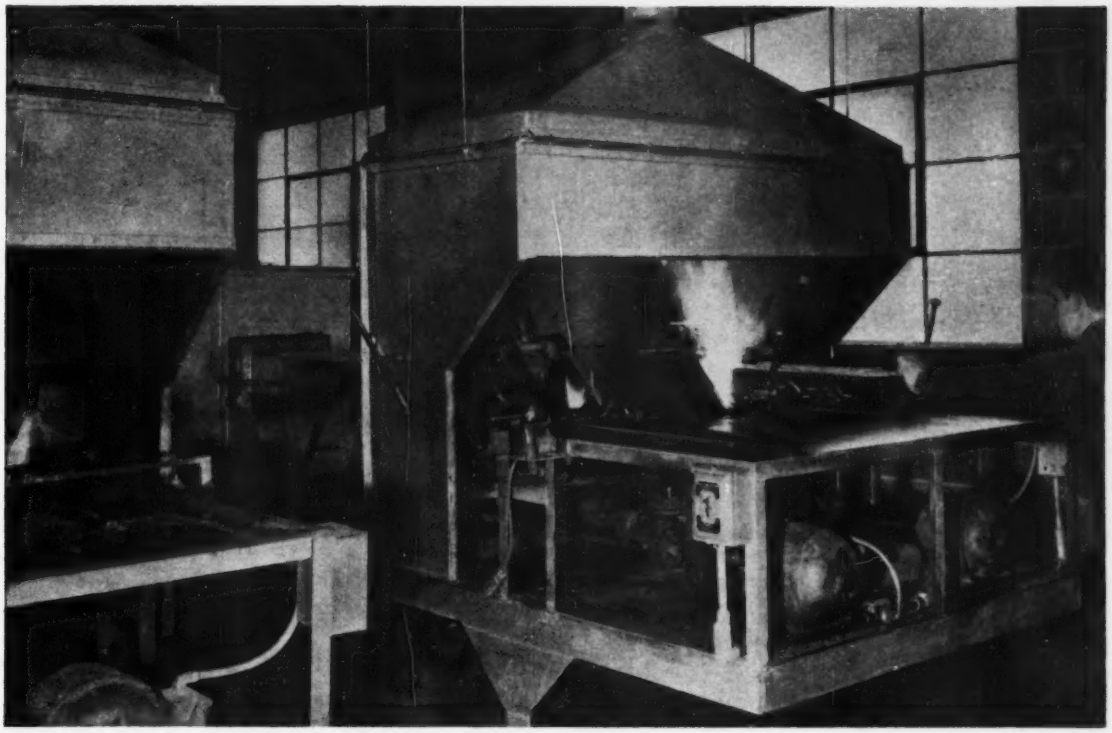


Fig. 3. A boat of cores about to start through a pre-sintering furnace. Once entirely within the furnace, a pusher-bar automatically advances the boat.

deep, accommodate ten cores apiece for the trip through the pre-sintering furnace. Before stoking the cores, the bottoms of the boats are covered with a layer of loose asbestos to prevent the cores from chipping.

In Fig. 3 a boat is shown entering one of the two lines of a pre-sintering furnace. Once within the furnace door, pusher-bars advance the boats through the furnace. These bars are mechanically driven by motors and reduction transmissions, which are visible beneath the loading platform of the furnace. Pre-sintering is performed in a non-oxidizing atmosphere; to maintain this atmosphere when the doors are open, solenoids automatically increase the flow of hydrogen gas.

Actually, the pre-sintering is broken down into two stages. The first stage serves to remove

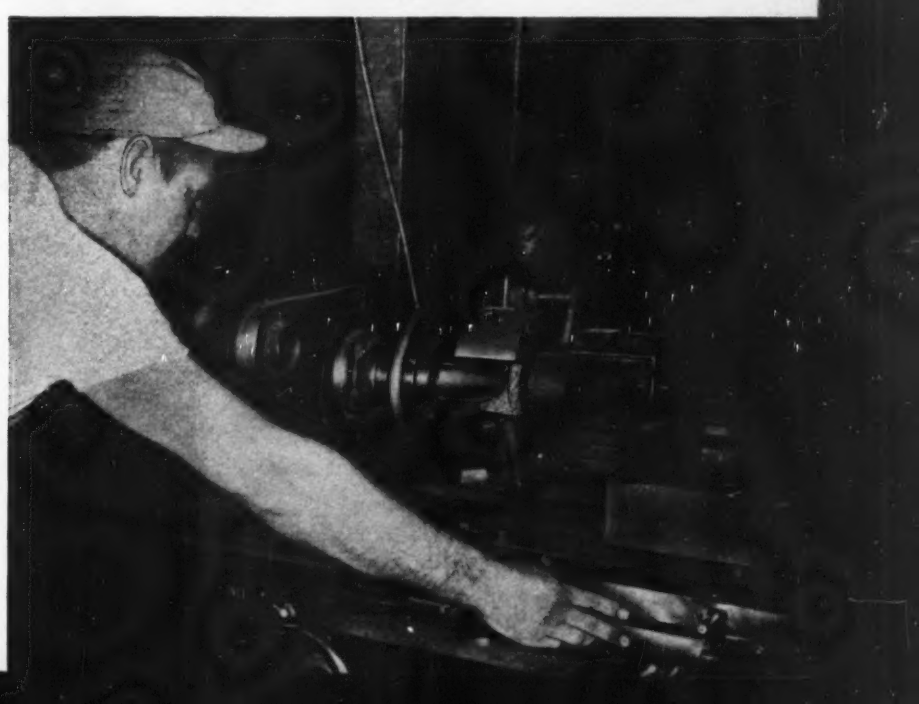


Fig. 4. Since the core after compacting is cylindrical from end to end, the ogive is formed in this plunge-grinding operation. The grinding wheel is dressed to the required radius of the ogive.

Fig. 5. Before sintering, the relatively soft cores are carefully handled in padded plastic trays. Cores are processed in batches so that their density can be rigidly controlled.

the paraffin from the cores. An oven temperature of slightly above 300 degrees C. is sufficient, causing the liquefied paraffin to drain through a tapered channel in the bottom of the furnace. Approximately ten hours is required for this stage. Each furnace line accommodates eight boats at a time, giving a loading rate of one boat every seventy-seven minutes.

In the second stage of pre-sintering, the hardness of the cores is increased. While the boat speed remains the same as for the first stage, the furnace temperature for the second stage is higher. Following the baking period, the boats pass through a cooling chamber. This stage leaves the cores harder, although still somewhat chalky. As the boats are conveyed from the furnace exit, a vacuum system removes and recovers the asbestos.

After pre-sintering, the noses of the cores—known technically as ogives—are formed. This is a plunge-grinding operation performed on a Cincinnati cutter grinder, as can be seen in

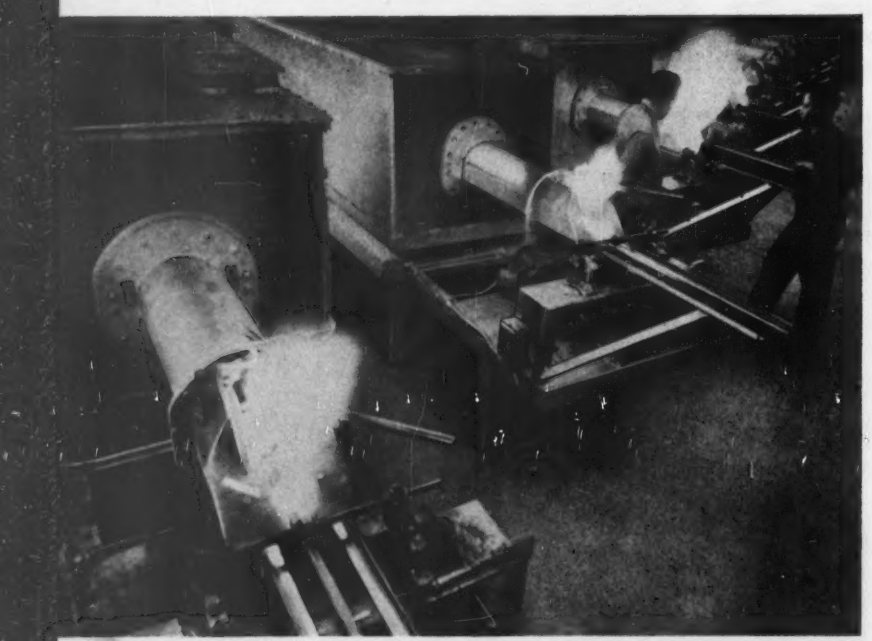


Fig. 6. A boat of cores is started through one of the eight sintering furnaces. The core hardness obtained is 83 Rockwell A scale.

Fig. 7. This rupture test is a 100 per cent inspection. As a precaution, the door of the testing machine is closed while the 80,000-pound load is being applied.

Fig. 4. The green silicon wheel that is used is dressed to the 3.335-inch radius required for the 76-millimeter shell cores. Wheel speed for the operation is 3600 R.P.M. Since the cores are fed to the wheel against a positive stop, this operation also establishes a uniform core length.

The cores, still relatively soft, are carefully handled on padded plastic trays, illustrated in Fig. 5. Full hardening—or final sintering—is the next operation, and the cores are conveyed to one of a battery of eight large sintering furnaces, shown in Fig. 6. Graphite boats are again used for this operation. Four cores are accommodated in each of these boats, which are 30 inches long, 5 inches wide, and 4 inches deep. Alundum is packed around the cores.

As in pre-sintering, sintering is performed in a non-oxidizing atmosphere, and each furnace has three heating zones separately regulated over a temperature range of from 1000 to 1500 degrees C. Approximately six hours is required by the boats to make the trip through the three zones. Another one and one-half hours is spent in a cooling chamber. During the sintering operation the cores undergo a dimensional shrinkage of about 18 per cent and increase in hardness to 83 Rockwell A scale.

Three important inspections follow. First, core density is checked on a Shadowgraph scale. In this procedure, the cores are weighed dry and then immersed in water and weighed wet. Density of the cores is automatically calibrated from the comparative weights registered, and must be within the range specified.

The second inspection consists of separating for reprocessing those cores on which the ogive has drooped excessively during sintering. (Where the ogive run-out is slight, correction is made in a subsequent grinding operation.)

Fig. 8. Two centerless grinding operations correct the out-of-roundness of the core periphery and reduce the core diameter to the finished size.

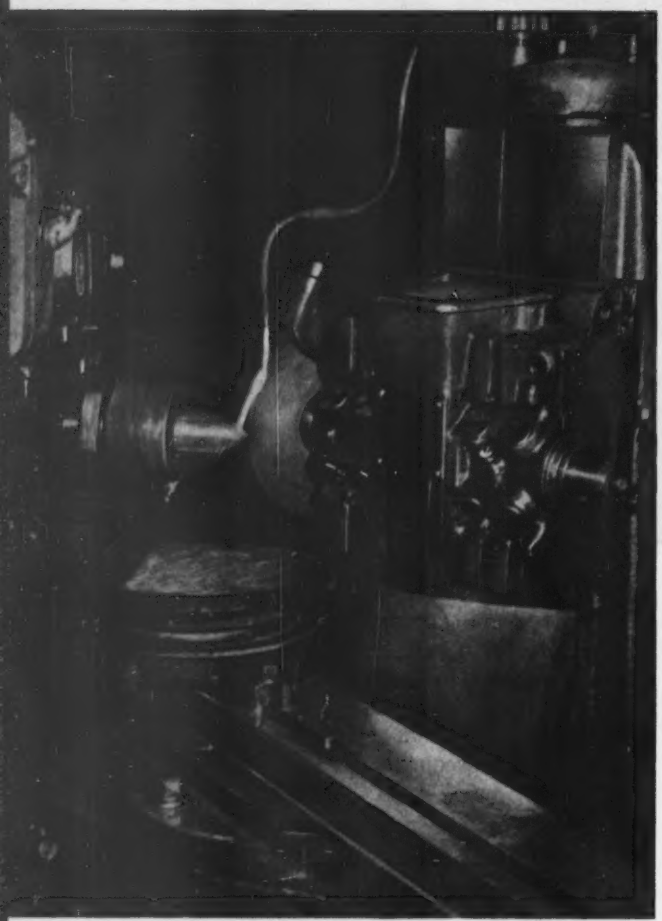


Fig. 9. Excessive ogive run-out is corrected in this grinding operation. A motorized radius type fixture rotates the core and simultaneously travels in an arc past the grinding wheel.

The third inspection is a rupture test, shown being performed on a Baldwin-Southwark testing machine and load indicator in Fig. 7. Each core is held for the test over two steel rolls which are of a specified hardness (55 Rockwell C scale) and which are a fixed center distance apart. This is a 100 per cent inspection; each core must withstand a pressure of 80,000 pounds. Since the cores have a higher Rockwell value than the steel rolls, flat spots are produced in the rolls after each test. Consequently, they must be rotated slightly for each core, and replaced when their surface is no longer usable.

With the completion of the rupture test, the shell cores are given a series of final grinding operations. One Cincinnati centerless grinding machine corrects any out-of-roundness of the core periphery. The cores are transferred to a second Cincinnati centerless grinding machine, shown in Fig. 8, where the finished core diameter—1.880 inches, plus or minus 0.015 inch—is obtained.

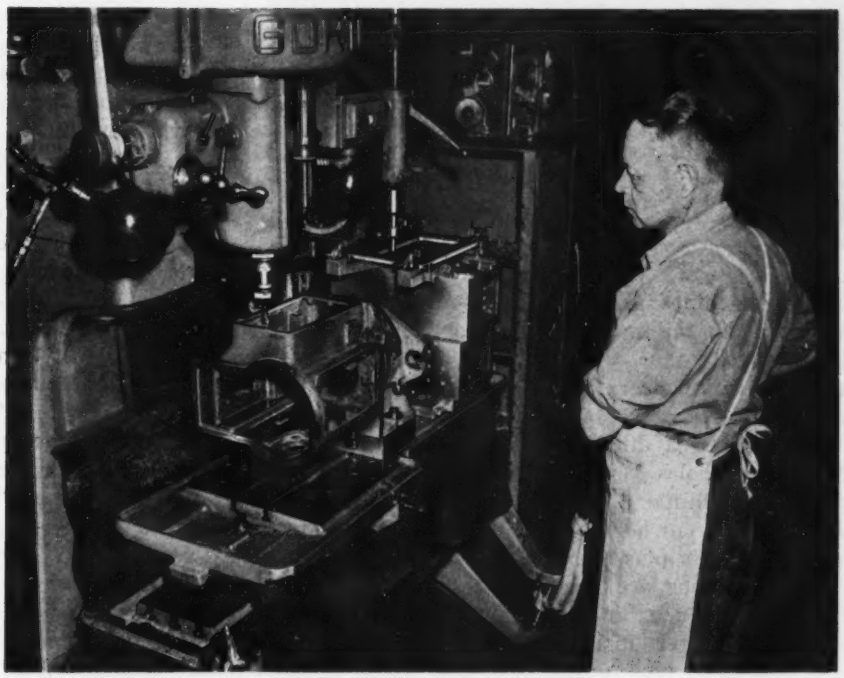
Ogives are inspected for concentricity with the core diameter. A simple fixture consisting of two pairs of rolls supports the core for this check. As the core is rotated, the contact point of the dial indicator bears on the ogive surface. Where the run-out is shown to exceed 0.050 inch total indicator reading, the ogive is reground on a Brown & Sharpe grinder, Fig. 9. A motorized radius type fixture feeds the work to the grinding wheel.

Cores are next held on their ogive end and surface ground to establish final over-all length. In Fig. 10, several work-pieces can be seen held in tandem in a fixture on a Thompson hydraulic grinding machine. A vitrified-bond diamond wheel is used for this operation, as well as for the preceding operation of generating the ogive radius.

Rockwell hardness, dimensions, and weight of the cores are given a final check in a 100 per cent inspection. Each core is etched with its batch number and date of manufacture, after which it is ready for rechecking by Army inspectors. The cores are then packaged and shipped to the subcontractor, who assembles the shell components.

Fig. 10. The final grinding operation consists of a series of passes over the the flat end of the cores to bring them to accurate length.

Precision Machining of Aircraft Control Parts



By CHARLES H. WICK, Associate Editor

TOLERANCES of only 0.0002 inch are commonplace for parts manufactured by the Mechanical Division of General Mills, Inc., Minneapolis, Minn. Such parts are used in fire-control computers, radar housings, and other mechanical, hydraulic, and electronic control devices for modern bombing and fighter aircraft. Some of the unusual set-ups and machining methods employed to produce these parts will be recounted here.

One particularly precise part is a yoke and shaft assembly for a vertical axis angle converter. This assembly consists of a cast stainless-steel yoke that is silver-soldered to a stainless-steel shaft prior to finish-machining. A hole bored in each leg of the U-shaped yoke for supporting the inner gimbals must be maintained within plus 0.0005 minus 0.0000 inch of the desired 0.8700-inch diameter. Then a stainless-steel bushing 11/32 inch wide is pressed into each hole, and the bushings are bored within plus 0.0000 minus 0.0002 inch of the 0.8125 inch diameter. Also, the two bores—which are 3 5/8 inches apart—must be aligned, and in the same plane as the axis of the yoke shaft within 0.0003 inch.

These exacting operations are performed on special Kearney & Trecker Autometric horizontal boring machines, such as the one shown in Fig. 1. The extremely sensitive machines have a wide range of feeds and speeds (steplessly variable), and are equipped with built-in measuring devices to facilitate operation and minimize the chance of error. Large-diameter micrometer dials on the machines have verniers graduated in 0.0001-inch increments, and the measuring screws are accurate to 0.0002 inch in 12 inches. Provision for precise indexing permits boring one hole or bushing, indexing the work through an angle of 180 degrees, and then boring from the other side, while maintaining tolerances within the close limits specified. These same

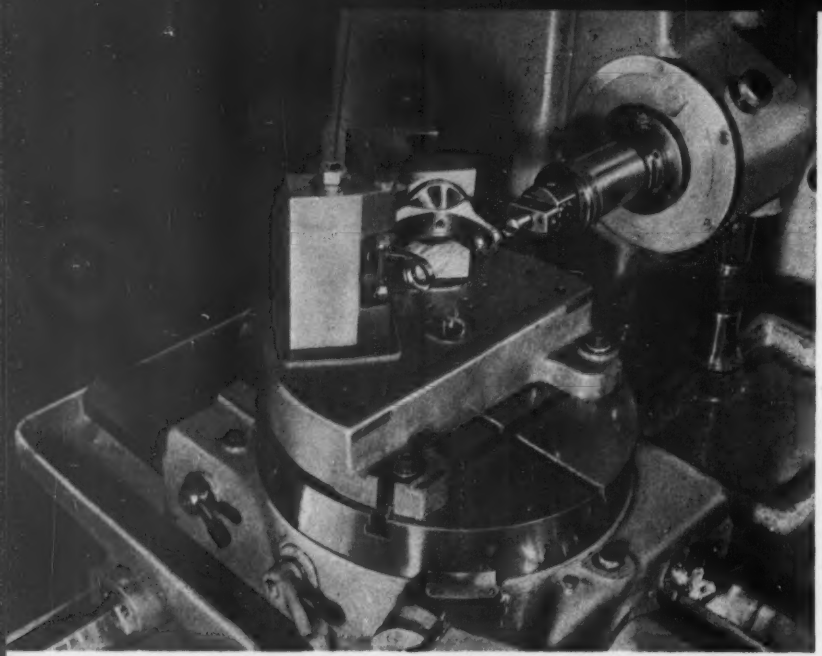


Fig. 1. Hole size is maintained within 0.0002 inch and alignment is held to 0.0003 inch in precision boring a stainless-steel yoke that has been silver-soldered to a shaft.

horizontal boring machines are also employed for subsequent precision milling operations performed on these parts.

Another close-tolerance aircraft control part —an aluminum-alloy assembly plate for a precision gear train—posed a difficult production problem. Of the eight holes bored in this plate, seven are in bronze bushings and one is in the aluminum plate itself. Four holes of 0.1874 inch diameter are bored within plus or minus 0.0001 inch, while the other four are machined to a diameter of 0.25015 inch plus or minus 0.00015 inch. The center-to-center distance between adjacent bores is held to plus or minus 0.0002 inch.

Because of the close spacing of the eight bores in this gear plate—varying from 1.2187 to 1.9583 inches—it was thought that the boring would have to be performed in two operations. Since this would involve reloading the work-piece and doubling the machining time, the possibility of boring all eight holes simultaneously was investigated. Although at first glance this might be considered impractical, the company succeeded in building the ingenious multiple-spindle boring head shown in Fig. 2 mounted on a modified Heald Bore-Matic machine.

The eight spindles mounted in this special boring head are rotated at 4000 R.P.M. by an endless, flat, fabric belt *A*, Fig. 3, 1 inch wide by 1/32 inch thick, that is in turn rotated by a double V-belt drive from the motor. Two double-row ball bearings *B* are mounted near the rear of each spindle, close to the driving pulley. A flat had to be ground on the periphery of the bearings mounted on the two closest spaced spindles. A Lord flexible coupling *C* is provided between the rear (driving) portion and the forward (driven) end of the spindles. The driven end of each spindle is supported by two internally grooved plain bearings *D*, through which a special light-oil lubricant is pressure fed. A clearance of 0.0002 inch is provided on each side between the spindles and the bores of the plain bearings. The lubricating oil is recirculated through a 50-gallon reservoir to lower its temperature. A 60-pound oil pressure is maintained in the housing which forces the shafts to float on a film of oil in the bearings.

Shrinkage of the aluminum gear plates after boring made it difficult to maintain the close tolerances required. To overcome this, the plates are now immersed in controlled-temperature hot water prior to boring, thus raising their temperature and minimizing the chance of error during subsequent shrink-

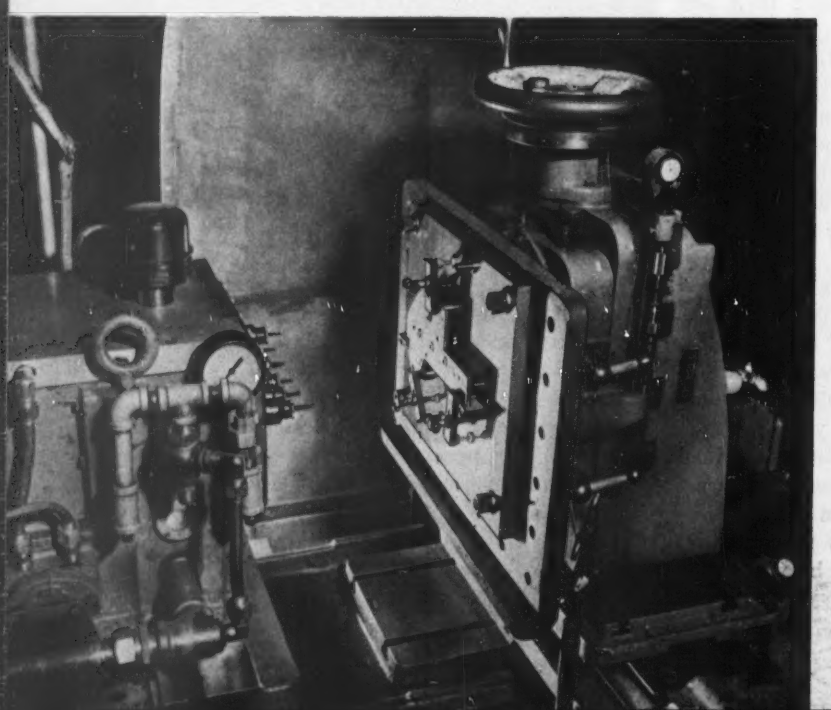


Fig. 2. A specially designed boring head with eight spindles is employed in this set-up to machine closely spaced holes in a gear plate.

age. The work-piece is held against three rest-button supports on a vertical fixture plate by means of three spring-loaded clamps. All eight holes are both rough- and finish-bored on the same machine, removing from 0.004 to 0.005 inch of stock from each diameter during finish-boring. The carbide-tipped boring tools are fed at the rate of 2 inches per minute, and a production of twenty-five gear plates per hour is obtained.

Accuracy required for the teeth of a rack used in fire-control computers could not be held on available rack-cutting machines. This production problem was solved by grinding the teeth from the solid, with the work-pieces held on the periphery of a drum fixture that is mounted between centers on an Ex-Cell-O thread-grinding machine, as shown in Fig. 4.

The racks, made from Type 416 stainless steel, are about 11/32 inch wide by 9/16 inch high and 5 3/16 inches long. Teeth on the rack have a circular pitch of 1/20, a pressure angle of 14 1/2 degrees, and a minimum total depth of 0.037 inch. The pitch line of the rack teeth must be held straight within 0.0005 inch, and the total accumulated error between any two teeth on the rack must not exceed 0.0005 inch per inch. These stringent requirements are easily maintained with the gear grinding set-up shown.

The drum fixture holds twenty-four work-pieces, the racks fitting into slots in the periphery of the drum and being clamped by wedge blocks that are secured to the fixture by screws. A vitrified-bond, aluminum-oxide, single-edge abrasive wheel, 20 inches in diameter and of 120 grain size, is employed for this operation. The wheel is rotated at 6500 surface feet per minute, while the work revolves at 4 feet per minute.

Considerable time has been

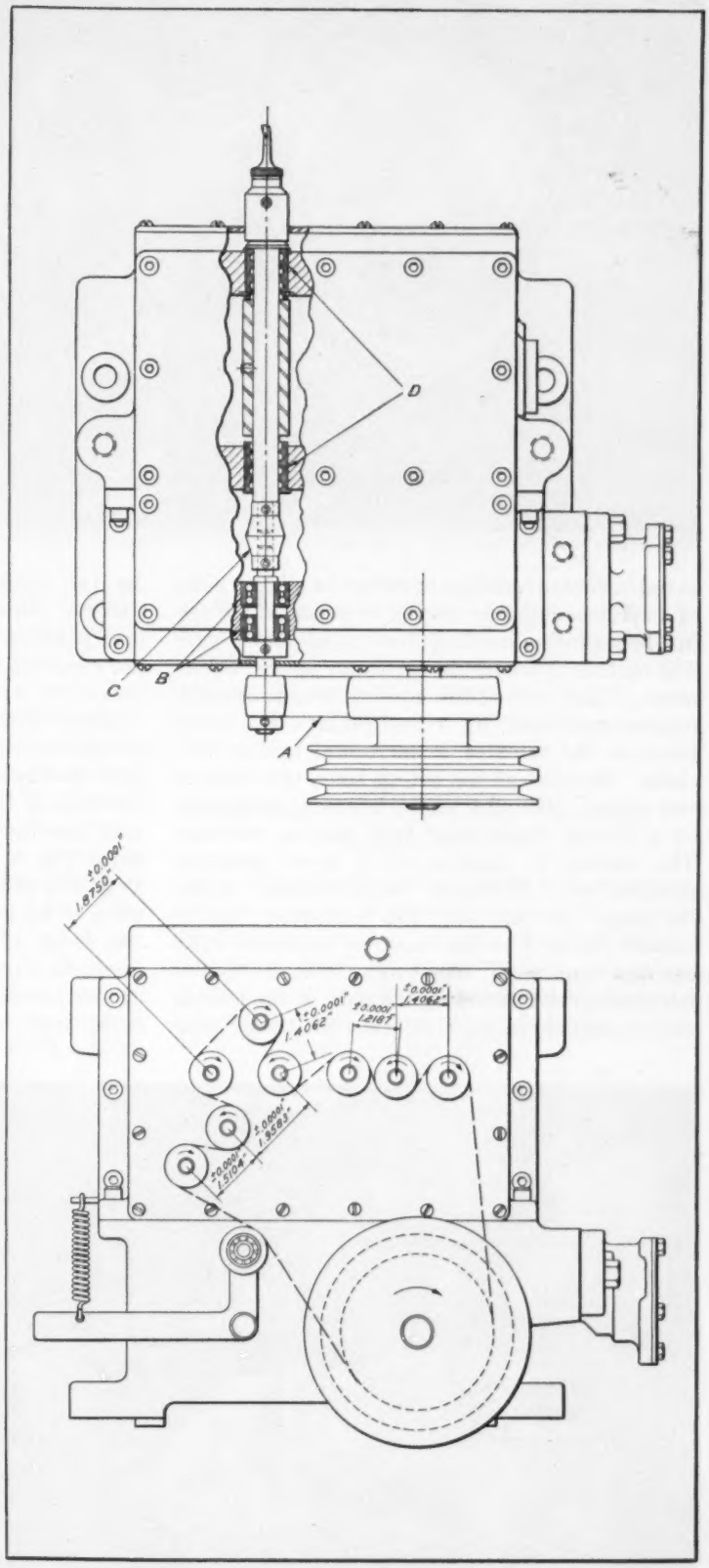


Fig. 3. Drive arrangement and details of one of the eight spindles provided in the special boring head shown in Fig. 2.

Fig. 4. Accurate teeth are cut from the solid in racks mounted in a drum fixture on this thread-grinding machine.

saved in contour-milling openings in all four sides of a magnesium-alloy casting by means of the set-up shown in the heading illustration and Fig. 5. The casting is a housing for radar optical equipment. Each side of the housing was previously contour-machined by repositioning the work-piece on the table of a horizontal milling machine. Because of the set-up time, this method was slow. Now the operations are performed on a Gorton duplicating type milling machine. The casting is clamped to a large faceplate mounted on a Hartford "Super-Spacer" indexing head. In this way, the work-piece can be rapidly indexed to the required positions without unclamping or resetting. Interchangeable templates, for controlling the path of the milling cutter, are held in position below the tracer spindle (at right in Fig. 5) by four quick-acting clamps. As each side of the casting is indexed into position below the milling cutter spindle, the required template is substituted for the one below the tracer.

Many different types and sizes of precision gears are required for the various aircraft control devices manufactured by the Mechanical Division of General Mills. One such close-tolerance part is the reduction gear hub seen being cut in Fig. 6. This sixteen-tooth gear, made from Type 303 stainless steel, has a normal diametral pitch of 48 and a pitch diameter of 0.3333 inch. The teeth, of American Standard involute tooth form, have a 20-degree pressure angle. Backlash on the normal pitch circle of the gear is held to 0.001 inch, eccentricity is maintained within

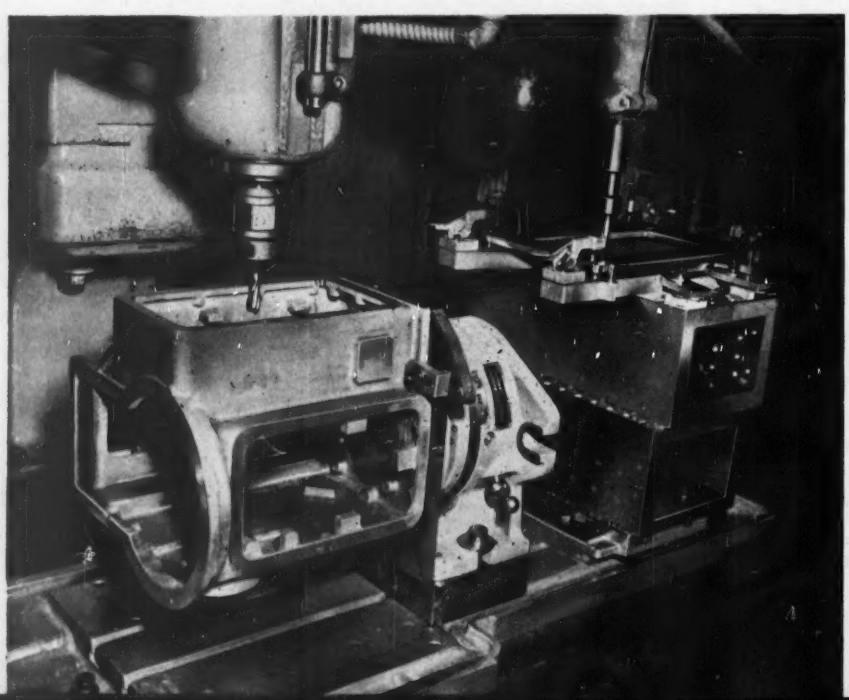


Fig. 5. A duplicating type vertical milling machine is employed for machining the contours on all four sides of a cast magnesium-alloy housing.

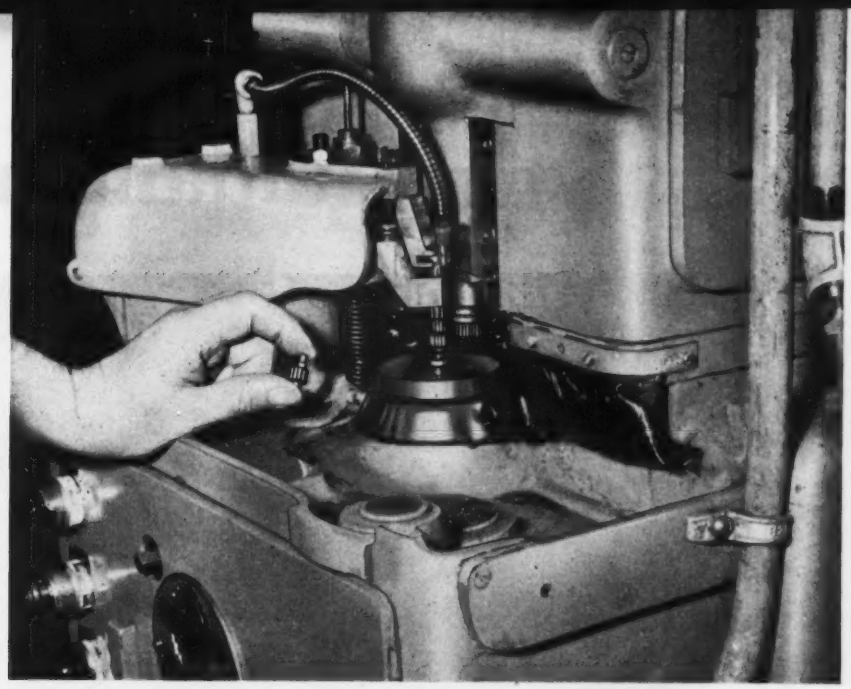


Fig. 6. High-speed shaper accurately cuts small precision gears such as the reduction gear hub shown in the operator's hand.

0.001 inch total indicator reading, and the outside diameter of the gear is kept concentric with the periphery of the gear shaft (0.1868 inch in diameter) within plus or minus 0.001 inch. The reduction gear hubs, as well as many other small precision gears, are accurately cut on Fellows high-speed gear shapers such as the one shown.

For improved accuracy, many of the aircraft control gears are shaved. For example, a forty-eight-tooth differential spur gear is shown in Fig. 7 being shaved on a Fellows fine-pitch gear shaving machine. This gear, made from Type 416 stainless steel, has a diametral pitch of 48, and maximum eccentricity between pitch diameter and bore at both ends of the gear is maintained within 0.0005 inch. The work-piece is mounted on an arbor that is held on fixed centers located in the headstock and tailstock in front of the rotary type shaving tool. The tailstock is spring-loaded, so that the end pressure on the work is the same at all times.

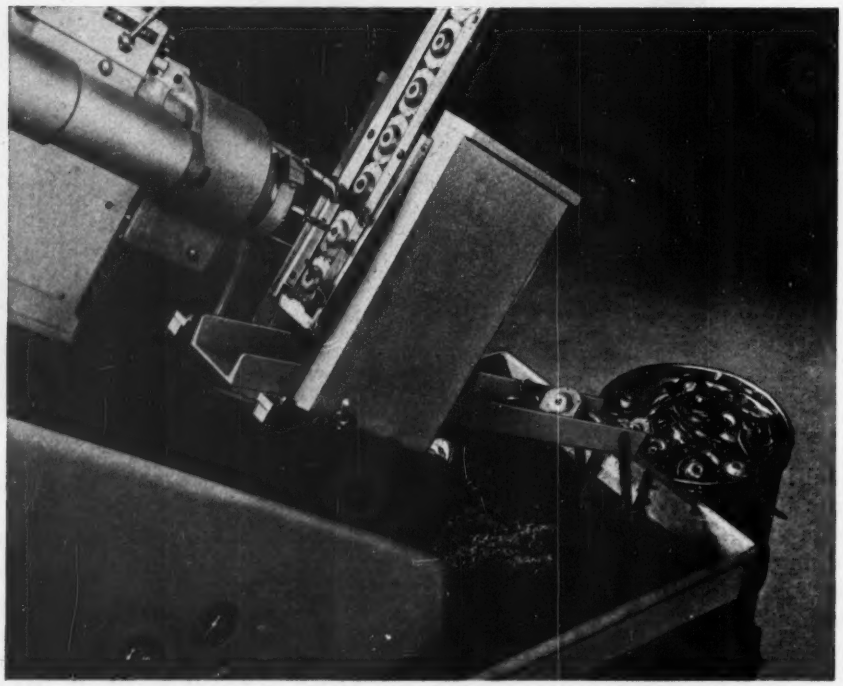
* * *

Million Artillery Shells Produced Weekly in 1952

The Department of the Army has announced that more than 52,000,000 rounds of artillery ammunition and in excess of 3,000,000,000 rounds of small arms ammunition, valued at approximately $2,000,000,000 were produced by American industry and Army ordnance manufacturing plants during 1952.

Fig. 7. Maximum eccentricity between pitch diameter and bore at both ends of this differential spur gear is held to 0.0005 inch by shaving.

Fundamentals of



CUTTING of internal threads in any material is a process that employs the familiar principles of many other machining operations. The problems that arise, however, require a more basic understanding than in other operations. The comparative complexity of reproducing thread forms efficiently and economically—which will comply with the extremely accurate dimensional tolerances that are required in present-day commercial products (and more so in defense materiel)—has created the need for a greater distribution of knowledge on this subject. The term "production tapping" is here applied to all tapping operations performed in sufficient quantity to warrant study of the methods, machines, and tools that should be used.

Cycle Time in Tapping

The time required to perform any machining operation can be divided into two parts—cycle time and handling time. In tapping, cycle time is the time necessary to complete one full stroke. Total length of stroke is equal to the length of chamfer on the tap, plus the clearance between the tap and the hole, plus the depth of full thread required, as shown in Fig. 1. The cycle time taken for the tap to traverse this distance and return to its original position is dependent on the spindle speed and the pitch of thread.

Selection of proper spindle speed for the initial set-up depends on previous experience and good judgment. Then observation will indicate the need for increasing or decreasing this speed. The peripheral speed that can be used depends on the machinability of the material being threaded and the cutting lubricant employed. Since the tap does not perform any useful work when reversing out of the threaded hole, it is advantageous to increase the speed during reversing. Most tapping devices employ a 2 to 1 reversing ratio.

For example, in tapping a 1/4-inch diameter hole having 20 threads per inch to a full depth of 1/2 inch in AISI 1112 steel (Bessemer screw stock), an initial selection for spindle speed might be 1375 R.P.M. (equal to a cutting speed of about 90 feet per minute). Length of stroke, expressed in equivalent number of threads, would be

Length of chamfer	3
Clearance between tap and work-piece	3
Depth of full thread	10
Total tapping stroke	16
Reversing stroke (2 to 1 ratio)	8
Total length of stroke	24

Production Tapping

Basic information is the simplest approach to production tapping problems. Cycle time, torque required, style of taps, lubricants, and design of work-piece and tooling are among the fundamentals described in this and a second article

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Since 1375 R.P.M. is 23 revolutions per second, and 24 revolutions are necessary, the cycle time would equal 24/23 seconds, or approximately 1 second.

At this spindle speed, it might be found that an average tool life of 2300 tapped holes would be obtained. This, being quite low, would indicate that a slower speed should be selected. If the spindle speed were reduced to 1070 R.P.M. (18 revolutions per second), which equals a cutting speed of 70 feet per minute, the cycle time would equal 24/18 seconds, or 1 1/3 seconds. While this is an increase of about 1/3 second in the cycle time, the average tool life might increase to approximately 13,000 tapped holes per sharpening, and net production would increase due to reduction in "down" time.

In this example, the initial selection of a spindle speed was purposely made too high, since, where there is some doubt, it is better to try the higher speed first. In this way, results will become apparent much more rapidly. Also, the common tendency to use slow speeds on tapping will be overcome. If results prove satisfactory, higher production will be obtained.

Handling Time Varies Considerably

Handling time for tapping or other machining operations is more complex because it usually includes a greater number of components that change with each job. Variations in the abilities of operators make it necessary that the handling of the part (selecting, positioning, and removing) be kept as simple as possible to eliminate fatigue, extra motions, and probability of error. The time required to actually cut the thread is the only useful time involved, and all other phases of the operation should be reduced to a minimum, since they tend merely to decrease production.

Loading of the work-pieces can be facilitated by arranging the parts in close proximity to the operator, and providing a tray or pan that will allow the parts to be grasped rapidly, as shown in Fig. 2. Both hands should be used in feeding. On small parts, the left hand can usually be employed for holding a small group of parts, and the thumb can be used to roll the part up to the fingertips for transfer into the right hand. The right hand merely places the part in the work-holding fixture.

Positioning of the part should be made without any forcing or difficulty of locating. This motion can often be used to initiate the tapping cycle by incorporating a limit switch in the fixture design so that the switch will be contacted only when the part is properly inserted. The obvious advantage of having both hands free for handling the part indicates that some automatic means of clamping must be employed where the part has to be held firmly during the tapping operation. This can also be accomplished through such a switch arrangement. The details of the fixture design most conducive to minimiz-

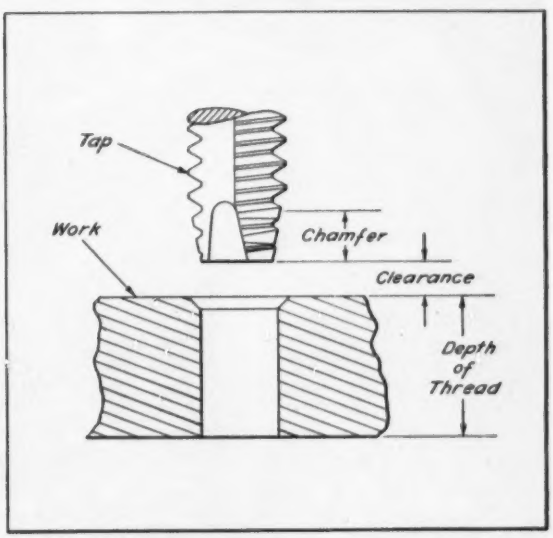


Fig. 1. Total length of stroke in tapping equals the length of chamfer on the tap, plus the clearance, plus the depth of thread required.

ing positioning time will be more fully described in the second installment of this article.

Removing or ejecting the part after it has been tapped is best performed automatically wherever feasible. There are many methods that may be used to allow positioning and ejection of other parts during the tapping cycle and such overlapping of operations will accelerate production considerably.

In general, there are two types of tapping operations—one involving short cycle time and long handling time, and the other having a long cycle time in comparison with handling time. Cycle time can be quite accurately determined, but handling time must be estimated with a definite knowledge of the motions required and the tooling method to be used. Where cycle time exceeds three seconds and the parts can be fed rapidly, an operator can usually feed two or more spindles, with a resultant increase of production. The total time for handling and tapping will give gross production. Net production will depend on the "down" time necessary for changing taps, setting up tooling to suit additional job lots, etc.

Torque Required in Tapping

The torque required to cut an internal thread is dependent on four major factors: the type of material being tapped, the style of tap employed, the percentage of thread required, and the type of cutting lubricant used.

Many attempts have been made to determine exactly the amount of torque necessary to tap a hole in order to develop some standard data that would be useful to industry. The actual value of such information, however, is limited because the number of variables involved make the results of even the most extensive test quite inconclusive.

Torque tests could and should be used as a basis for verifying certain fundamentals of tapping operations and less complex single-point cutting tool tests. The important job is to determine what factors tend to allow the use of minimum torque in cutting a thread—not the inch-pounds of torque necessary on some one job under specific conditions. The lowest torque will permit the maximum tool life and most efficient operation.

All other factors remaining constant, torque will increase and tool life (number of tapped holes per grind) will decrease as the diameter of the tap becomes larger. This relationship is shown by the curves at *A* in Fig. 3. Also, the torque will rapidly increase, and the tool life will decrease as the pitch (number of threads per inch) decreases, as shown at *B*. The curves at *C* show how the torque increases and the tool life rapidly decreases as the percentage of thread increases. On the other hand, the tool life improves and the torque decreases as the spindle speed is increased—up to the point where the peripheral speed exceeds the machinability limit of the metal being cut. Beyond this point, the

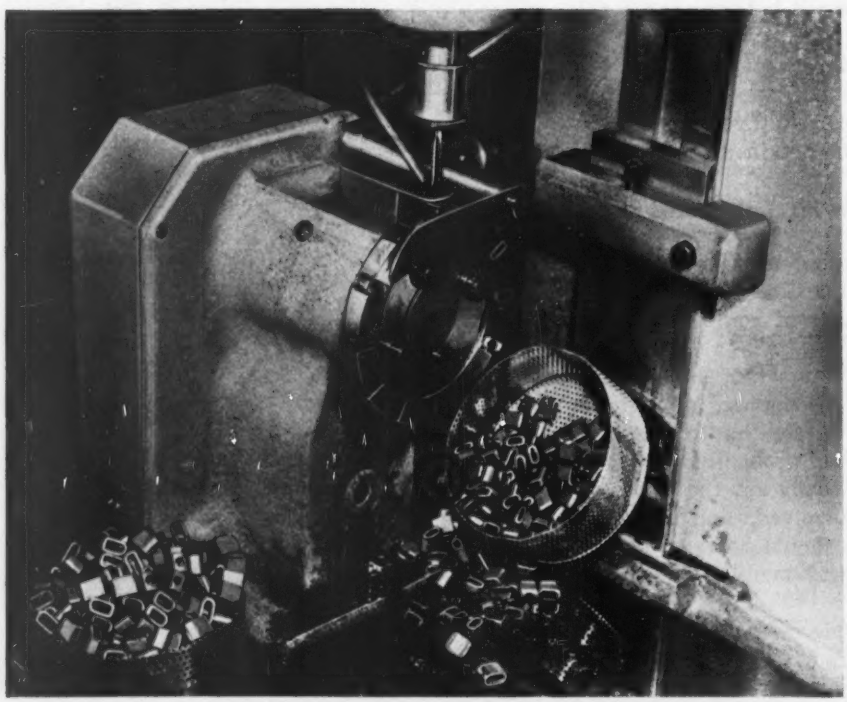


Fig. 2. Loading of workpieces is facilitated, and handling time is reduced to a minimum, by providing trays of parts close to the operator.

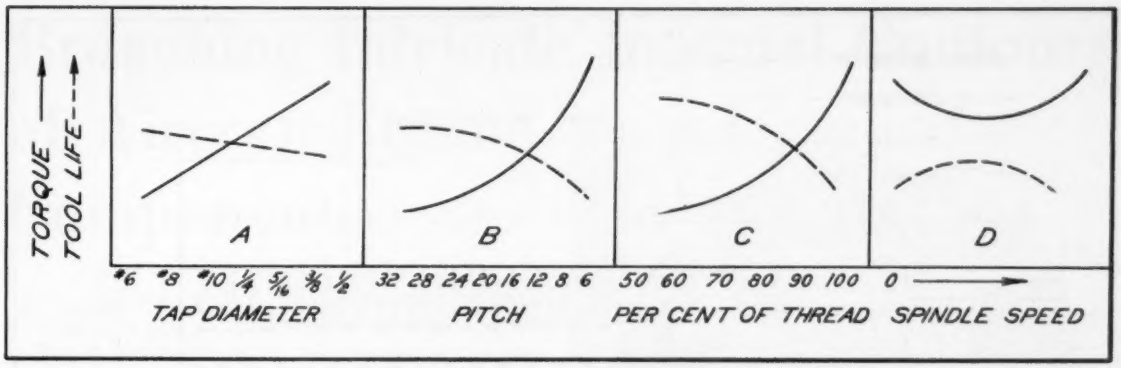


Fig. 3. Typical curves showing how changes in tap characteristics affect torque and tap life.

torque increases and the tool life decreases as the spindle speed is raised, illustrated accordingly by the curves at *D*.

Style of Tap to be Employed

It has been established that each type of material requires variations in tool design for maximum operating efficiency. Theoretically, every tapping operation that differs to some slight extent from another should have a tap specifically designed for that operation to obtain ideal results. For the great majority of jobs, however, this procedure would be economically impractical. Variables that make it so include the type of material to be cut, and the diameter, pitch, number of flutes, length of chamfer, shear, hook, etc., of the tap.

It is, therefore, most expedient and least expensive to select the nearest proper style of standard tap that is available from manufacturers, and, where necessary, alter the tap slightly for each job. Although this procedure may not permit maximum tool life and production, it will at least provide reasonable tool life and production. All tap manufacturers must conform to dimensional tolerances and specifications that are established by screw thread standards. However, some, through experience, knowledge, and manufacturing methods, produce a more consistently uniform and better grade of tap.

Tap users are often at fault for many tapping troubles which are traceable to improper tool application. This is usually due to the fact that correct taps cannot be supplied unless details of the job for which they are destined to be used are furnished at the time of purchase. Type of material, depth and size of hole, class of fit, and any other data which will familiarize the supplier with the nature of the job should be submitted wherever possible. It would be well for many users to apply the same procedure in their tool-cribs, since the habit of issuing the same type of tap for all jobs is widespread.

Tap selection should be based on the style of tap. The number of flutes, Fig. 4, would be the first consideration, and this depends on the type of material to be tapped and the nature of the chip produced. If the material is such that the chip will crumble and break up readily (as with cast iron or cast brass), more flutes may be used than is the case when a tough, stringy chip is obtained. No ironclad rule can be laid down, but a good general practice for the numbers of flutes is shown in the accompanying table. The depth and percentage of thread will also affect the selection of the number of flutes.

Length of chamfer is the next consideration in tap selection. In order that the amount of work or load may be equally divided, each cutting tooth must remove approximately the same amount of material. Equal distribution of the load will help to minimize the torque required, increase the tool life, and assist in maintaining accuracy. Just how much material should be removed by each tooth is also a speculation, but each tooth should cut and not rub. Normal procedure is to allow a 2 to 3 thread chamfer, although the number of lands will affect the number of cutting edges in action. A long chamfer is unnecessary and adds to cycle time. Each tooth

Number of Flutes for Tapping Various Materials

Size of Tap, Inch	Material to be Tapped	
	Steel, Copper, Bronze, Etc.	Cast Iron, Cast Brass, Etc.
	Number of Flutes	
Under 1/4	2	2
1/4	2	2 or 3
1/4 to 3/8	3	3
3/8	3	3 or 4
3/8 to 5/8	4	4 or 5

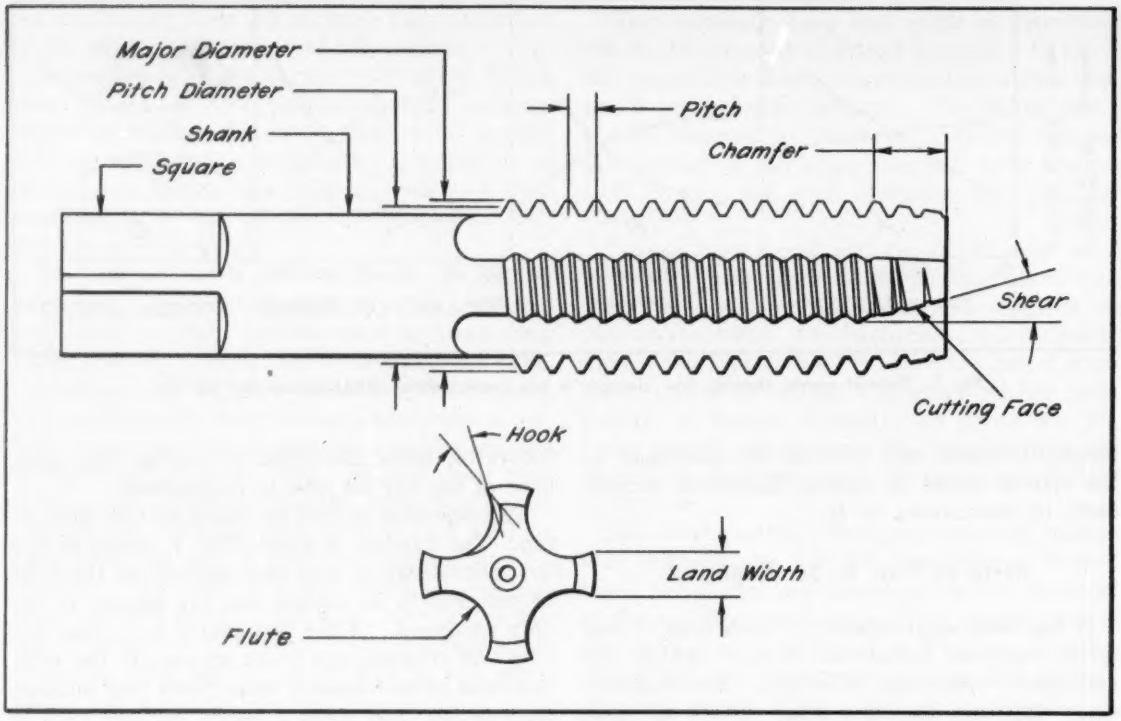


Fig. 4. Elements of tap style which must be considered in selecting the proper tap for any particular job.

should remove the maximum volume of material conducive to good tool life.

In many cases, the power required to break up the chip in the flute exceeds that required to actually cut the thread. Since the torque should be kept at a minimum, some means should be provided to push the chip ahead so that it would not be necessary to break the chip in the flute. Shear at the cutting edge of the tap provides an angular cutting face that will drive the chip ahead. On through holes, the use of shear will eliminate chip problems. On blind holes, however, sufficient chip room must be allowed to prevent the tap from striking the bottom of the hole.

Hook or rake on a tap is used in the same manner as on a single-point cutting tool—the type of material being cut controlling the amount necessary. On steel, copper, or aluminum with tough, stringy chip characteristics, the hook should be sufficient to give a free cutting action, but not enough to weaken the cutting edge. A "gun" tap illustrates the amount of hook and shear required for such material.

The land on a tap serves two functions: to supply strength to the cutting teeth and to support the tap in the hole. Too wide a land will produce excessive friction, and, on larger taps, it is better to use a greater number of lands of narrow width.

The class of fit desired in a tapped hole is the tolerance or looseness permitted between the pitch diameters of the tapped hole and the screw or bolt. Each size of thread has established tolerances which must be maintained in order to meet the class of fit desired. Two types of taps are available for producing different fits: commercial ground taps that are held to a pitch diameter tolerance of slightly over basic to about 0.0015 inch above basic, and precision-ground taps that are further divided into

No. 01 tolerance—basic to minus 0.0005 inch;
No. 1 tolerance—basic to plus 0.0005 inch;
No. 2 tolerance—plus 0.0005 to plus 0.0010 inch.

Material to be tapped, spindle speed and rigidity, cutting lubricant, and other variables will affect the amount that the tap will cut over size.

Other factors of tap design such as eccentric relief, interrupted threads, spiral flutes, etc., are of a more special nature, requiring such infrequent use as not to warrant inclusion under this general discussion. Tap "loading," or pick-up, and welding of the material on the surfaces of the tap are generally considered problems of spindle speed and cutting lubricant, although proper nitriding of the tap to produce a greater surface hardness and longer wearing qualities may assist in decreasing this tendency.

Broaching Intricate Internal Contours of Aircraft-Engine Components

SIX identical contours located between internal lobes on the aircraft-engine part illustrated in Fig. 1 are broached in two passes of the tool provided on a standard Colonial broaching machine. Three alternate contours are broached during the first pass of the tool which is seen in Fig. 2, and the remaining three contours are broached in the second pass. The work is transferred from the first station of the shuttle fixture to the second station between the two passes.

The broach is built up with inserted cutting sections. Multiple shoes guide the broach above and below the work. These shoes contact grooves in the broach and insure dimensional accuracy to a high degree.

Twelve dowels in each station of the fixture—six above and six below the work—engage holes in the lobes of the work-piece to provide firm support of the lobes. The thin-walled projections are held securely so as to prevent any distortion during the operation.

In the center of the shuttle fixture is a large opening through which the broach is returned to its starting position upon the completion of each pass. The broach is so designed that it is retrieved automatically. The movement of the slide of the broaching machine and shuttling of the fixture are electrically interlocked by means of limit switches. In this manner, it is impossible for the broach to descend until a work-piece is in proper position.

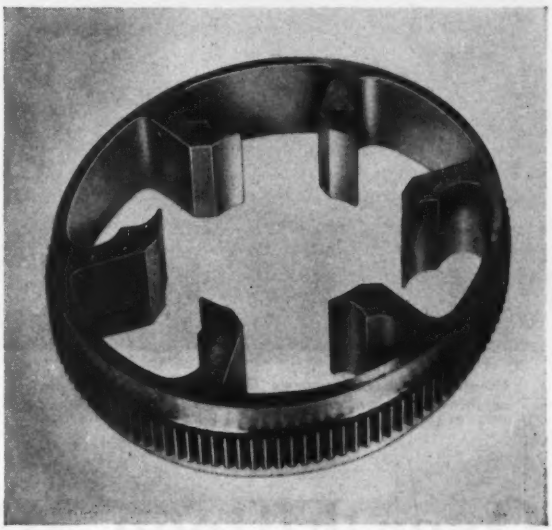


Fig. 1. Six lobes of this aircraft-engine part are broached in two passes on a Colonial single-ram pull-down broaching machine.

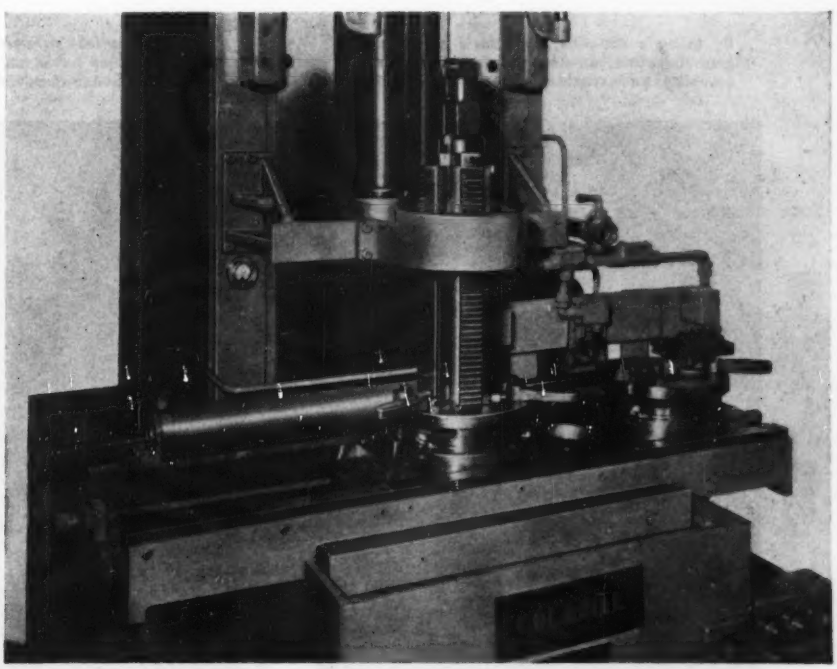
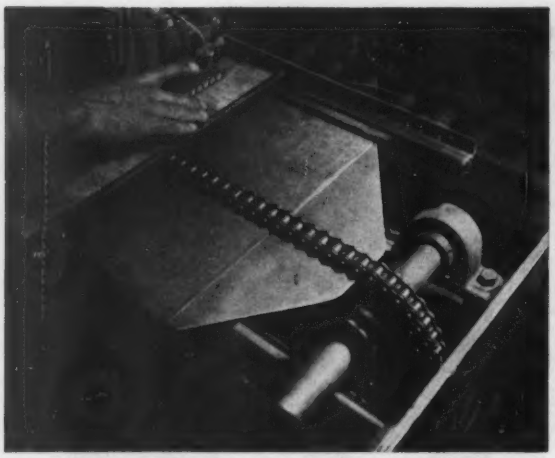
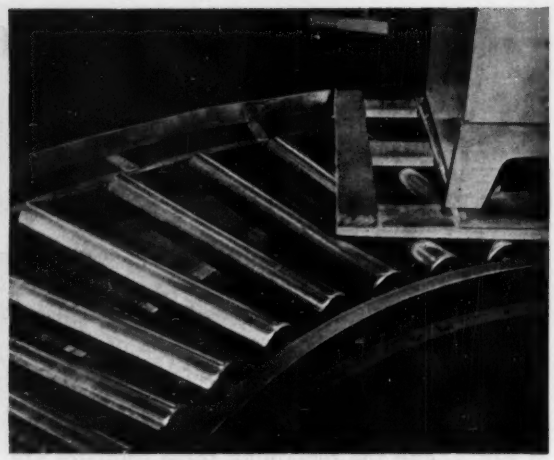


Fig. 2. General view of the broaching machine showing the built-up broach and the shuttle fixture with its two work stations.



Sheet-steel guard prevents fingers or clothing from catching between chain and sprocket. Chain drives test conveyor for radio assembly line.



Guard rail along outer curve in roller conveyor line prevents television or radio cabinet from falling off and injuring shop personnel.

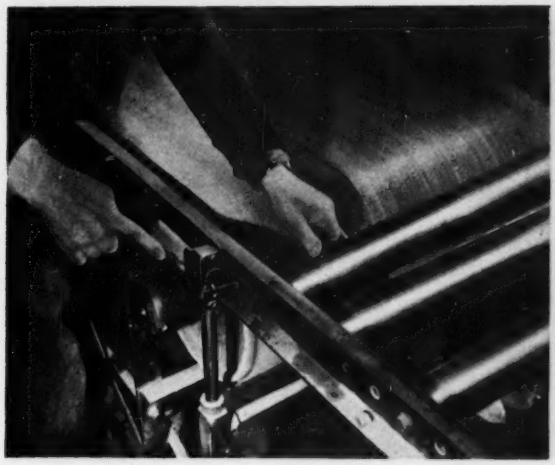
Over Fifteen Million Man-Hours

AN all-time safety record for the electrical equipment industry has been set by the employes of the Westinghouse Television-Radio Division, Sunbury, Pa., who have recently completed 15,040,000 man-hours without a lost-time accident. But setting the record itself was no "accident." It was the fruition of eleven years of careful planning—of eleven years spent in the dogged pursuit of a well-balanced accident prevention program. The program encompassed engineering for safety, training in safe work habits, and cultivation of a safety-conscious esprit de corps.

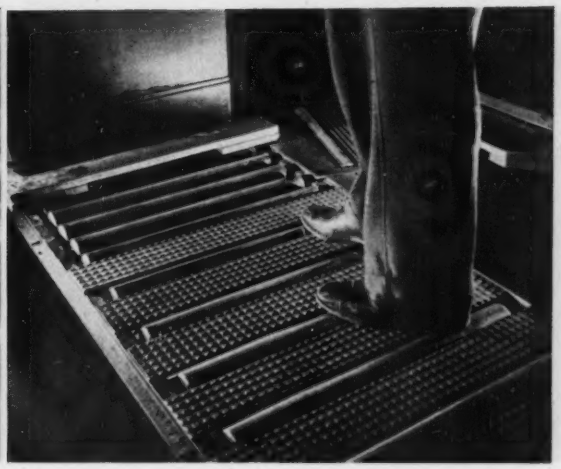
Before the plant went into operation in 1942, concern about the workers' safety influenced decisions as to where production lines and conveyors were to be arranged, and where machines and assembly benches were to be set

By using a die-pick, operator's hand never gets between die-blocks. Danger of ram catching and crushing hand is eliminated.

Expanded-metal cylinders make ideal holders for hot solder irons not in immediate use. Fan above bench removes fumes of soldering.



If fingers wedge in between belt and junction roller, slotted bearing causes roller to move away, automatically tripping switch to stop belt.



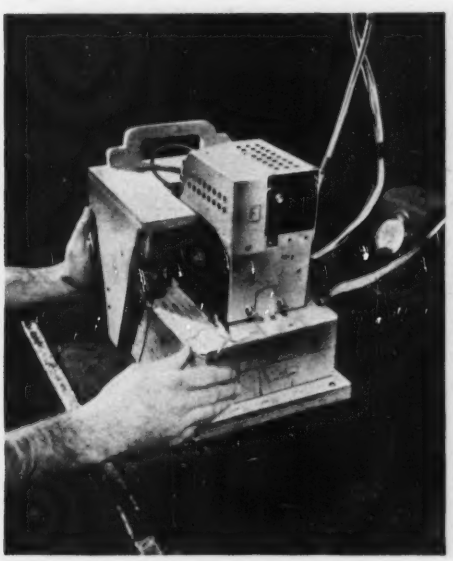
Where inspections of objects are necessary while on a floor type conveyor line, non-skid treads have been placed between rollers.

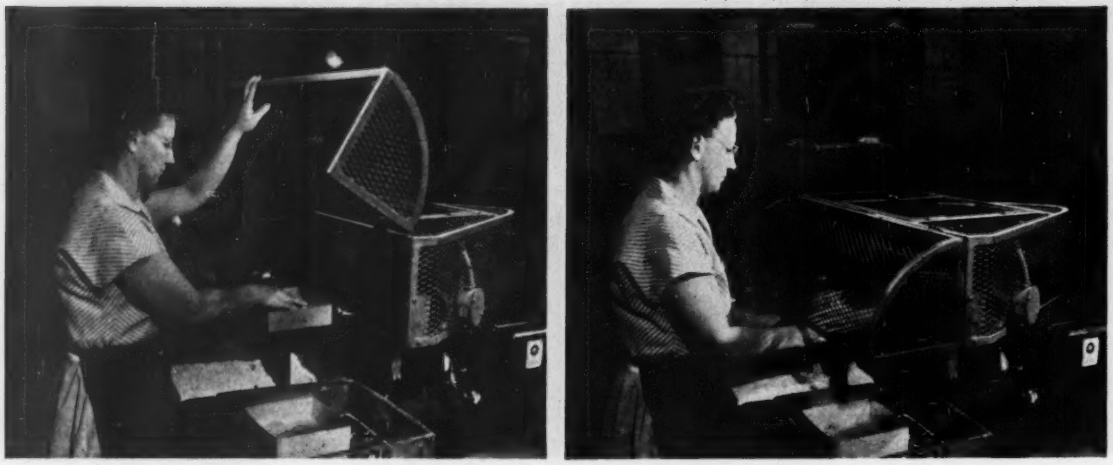
without a Lost-Time Accident

up. Manual lifting and handling between receiving dock and shipping platform were reduced to a minimum; guards were put on machine tools; interlocks were provided for testing equipment; and special dollies were constructed for handling parts, sub-assemblies, and complete assemblies.

Safety education and training have been both vigorous and effective ever since the plant started operating. A safety committee includes the manager of manufacturing, two general foremen, the captain of the plant police, the industrial relations manager, and the industrial relations supervisor. From the beginning, the committee has centered its interest on the teaching of proper work habits. Much has been accomplished by appealing to the employes' pride in a good plant safety record. In another

(Left) Test block high-voltage circuit is dead with cover open. Operator can safely remove tested power pack, replace it with another. (Right) Circuit is alive with cover closed. Cover also serves to protect operator from coming in contact with wire carrying high voltage.





(Left) When expanded-metal cage of wire cutting and stripping machine is raised to the "up" position, a switch cuts off power, enabling operator to unload and load safely. (Right) With cage lowered to the "down" position, machine operates. Tote box can be reached under cage, but power is cut off if operator's arms reach in further.

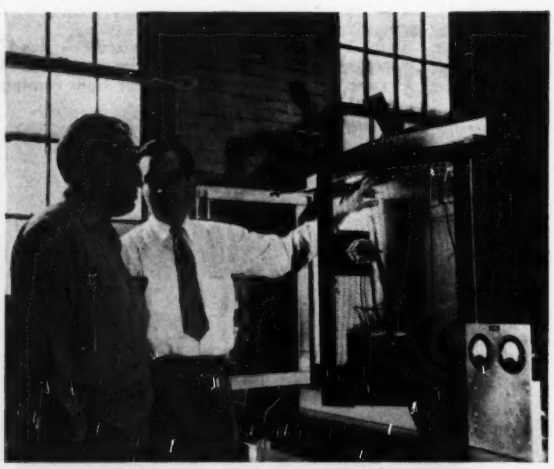
phase of the program, trained safety observers walk about the plant, constantly on the lookout for hazardous work practices and conditions.

The printed word is used forcefully in safety stories published in the monthly plant section of the *Westinghouse News*. By means of safety messages and bulletins posted at strategic points in the plant, safe work practices are brought to the employes' attention. Two recurring hazards—horseplay and running—get plenty of attention from the committee.

The role of the plant physician is most important. Not only does he treat every minor injury promptly, but immediately afterward he makes an effort to uncover the carelessness or hazard responsible for the injury. His periodic report of accidents is routed to every foreman in the plant, and posted on bulletin boards as well.

Coupled with the importance of creating a favorable attitude toward safety in the worker is the importance of engineering every job for safety. Procuring special protective clothing for workers and constructing protective devices

When counterweighted gate opens, stops automatically rise to keep cartons from dropping off conveyor. When gate closes, stops drop below rollers.



A foreman explains the operation of interlocked doors on high-potential test equipment to an inspector. Opening of doors automatically makes unit non-operative until doors are again closed.

(Left) Work-holding clamp for riveting operation keeps hands safe distance away. In loading position, clamp is retracted over anvil of machine. (Right) Advancing clamp over bracket, rivet, washers, and insulating material preparatory to upsetting rivet leaves hands free to hold chassis during riveting operation.

for machines, conveyors, assembly lines, and testers are part and parcel of the safety engineering phases of the program.

A consequence of all these efforts is reduced human suffering. It has been written into the record at Sunbury: only nine disabling accidents in the history of the plant. Of the more than 25,000,000 man-hours worked, injuries have accounted for about 4200 man-hours of lost time, resulting in astonishing low rates of accident frequency and severity.

In workmen's compensation payments alone—a direct measure of the amount of time lost through injury—savings of more than $100,000 have been realized when compared with the average for all Westinghouse plants. The savings are even more significant when compared with industry in general, being nearly $250,000. For the last two years, the cost of workmen's compensation has been nil. For the three-year period prior to that, workmen's compensation cost one cent per $100 of payroll. During the 15,040,000 man-hours just completed without a lost-time accident, the average factory in the United States would have had at least 1 fatality, 8 permanent partial disabilities, and 126 temporary total disabilities—135 accidents.

* * *

Correction—"Cotangent" Should Have Been "Tangent"

On page 204 of January MACHINERY, in the article "Bore-Grinding Fixture for Bevel Gears," the formula for calculating a dimension was given as follows: $f = c \cot \phi$

The formula should have read: $f = c \tan \phi$

Underground Corrosion of Galvanized Steel Studied

A report on the underground corrosion of hot-dipped galvanized steel pipe, recently completed by the National Bureau of Standards, showed that galvanized steel having 3 ounces of zinc per square foot of exposed surface is highly resistant to corrosion in many soils which are very corrosive to bare steel. For the Bureau's study, short lengths of both galvanized and uncoated steel pipe, and also plates of zinc, were buried at fifteen test sites for periods up to thirteen years. Located in widely separated parts of the United States, the test sites represented a broad range of soil properties.

After each of five periods of exposure, a set of specimens of the different materials was removed and returned to the laboratories. There the corrosion products were removed and determinations made of loss in weight, depth of the deepest pits, and the percentage of area on the galvanized specimens on which coating remained. In one soil, in which bare steel pipe was perforated by corrosion after exposure for only a few years, the coating on the galvanized specimens remained continuous throughout the entire thirteen-year period. In only two of the fifteen soils, both organic, was the zinc coating of negligible protective value.

* * *

The American system of coins was devised by Thomas Jefferson over 160 years ago. The only major addition to his system is the nickel, which at present bears his portrait, and consists of 25 per cent nickel and 75 per cent copper.

Spotting-In Propeller Tooling with Special Die Set

MASTER patterns for contour-milling machines and duplicating planers, as well as fixtures for holding work-pieces in machining and brazing operations, are required in large number by one of the leading manufacturers of airplane propellers. Each piece of tooling must be made to conform accurately to the contour of the propeller surfaces at the particular stage in the manufacturing process where the individual master or fixture is to be employed.

The production of this tooling necessitates many spotting-in operations to insure that the contours finished on the masters and fixtures meet specifications within the extremely close tolerances allowed. Spotting-in has been facilitated in this plant by the use of a special die set measuring 46 inches by 140 inches and weighing 13,900 pounds. The die set was supplied by Danly Machine Specialties, Inc., Chicago, Ill.

One of the functions of this die set is to provide accurate closure between the master pattern and the unfinished tooling during the spotting-in operation. Since accurate closure is thus assured, it is possible to attain a high degree of accuracy in working down rough tooling to mate with master patterns. The die set provides a means of spotting-in the contour surfaces of tooling in the exact relation to keyways that establish correct registry of the tooling in the production line. Thus, the registry of each spotting-in set-up is determined by means of keyways located at right angles to each other in both the upper and lower halves of the die set, in the manner seen in Fig. 2.

A master pattern is located on the upper half of the die set by means of keys and the tooling member on the lower half. Because the arrangement of the keyways is identical in the spotting-in and production set-ups, cumulative errors and jockeying of tools in production set-ups are eliminated. This saves time and assures accuracy in duplicating finished propellers.

As spotting-in of a tooling member nears completion, a close check is made for accuracy by means of a bridge gage, such as shown in Fig. 3. This gage can be set squarely across the tool by means of indexing stations on each side. The indexing stations consist of accurately located holes in hardened and ground steel inserts dow-

Fig. 1. Spotting-in operation of a brazing fixture employed in airplane propeller manufacture is being facilitated by the use of a special Danly die set.

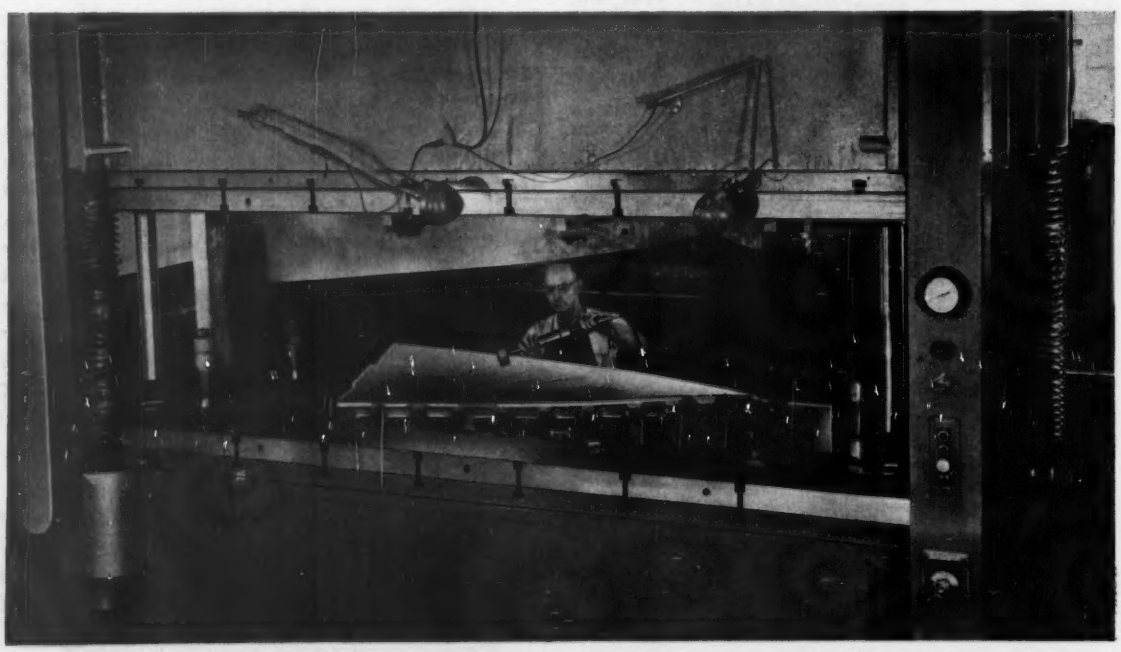


Fig. 2. The spotting-in die set is provided with keyways extending at right angles to each other that insure identical registry of tooling in both spotting-in and production set-ups.

eled in grooves on opposite sides of the die-set shoe. In each station a template is used that conforms to the required propeller contour on the particular line of reference. The template can be adjusted vertically with ease, and height settings can readily be determined by means of dial indicators which are mounted on each side of the bridge.

Propellers are made of S A E 4340 steel drop forgings in the plant where this Danly die set is being used. Due to their large size, the propeller-blade thrust members are forged in halves and resistance-welded into units prior to machining. Reinforcing ribs and a contour on the camber side of the propellers are routed out on Keller machines. In that operation they are held on magnetic chucks which are finished and checked in the die set.

Sheets that form the exterior contour on the cambered side of the finished propeller blades are made of tapered S A E 4340 stock. These cambered sheets are formed to the required contour in a die after being heated to 1000 degrees F. and held at this temperature for twenty minutes. The contact edges of the blades are next sprayed with copper, and then the cambered sheets are assembled to the propellers by brazing. For the brazing operation, the cambered sheets are clamped in fixtures of the type seen on the die set in Fig. 1. The brazing operation is performed in a continuous electric furnace having a controlled atmosphere.

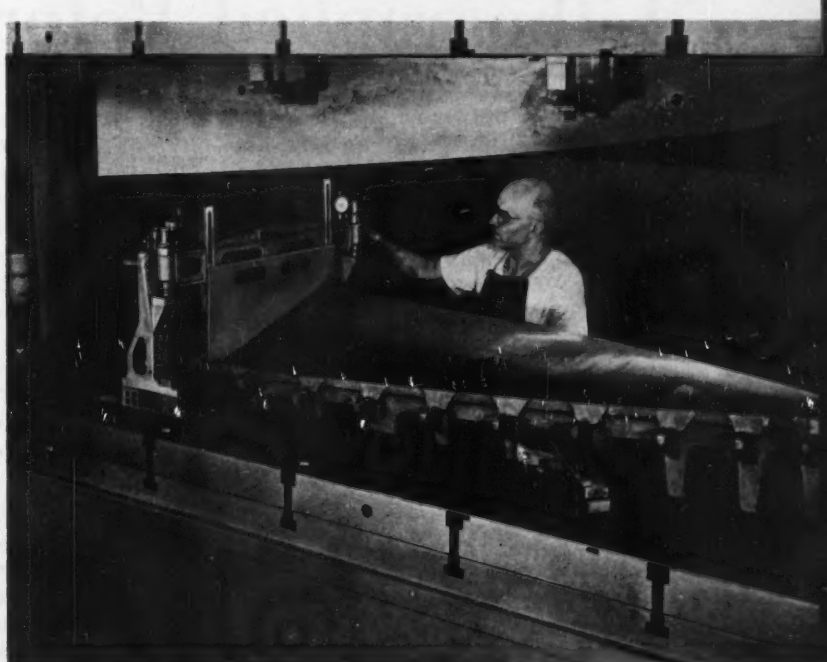
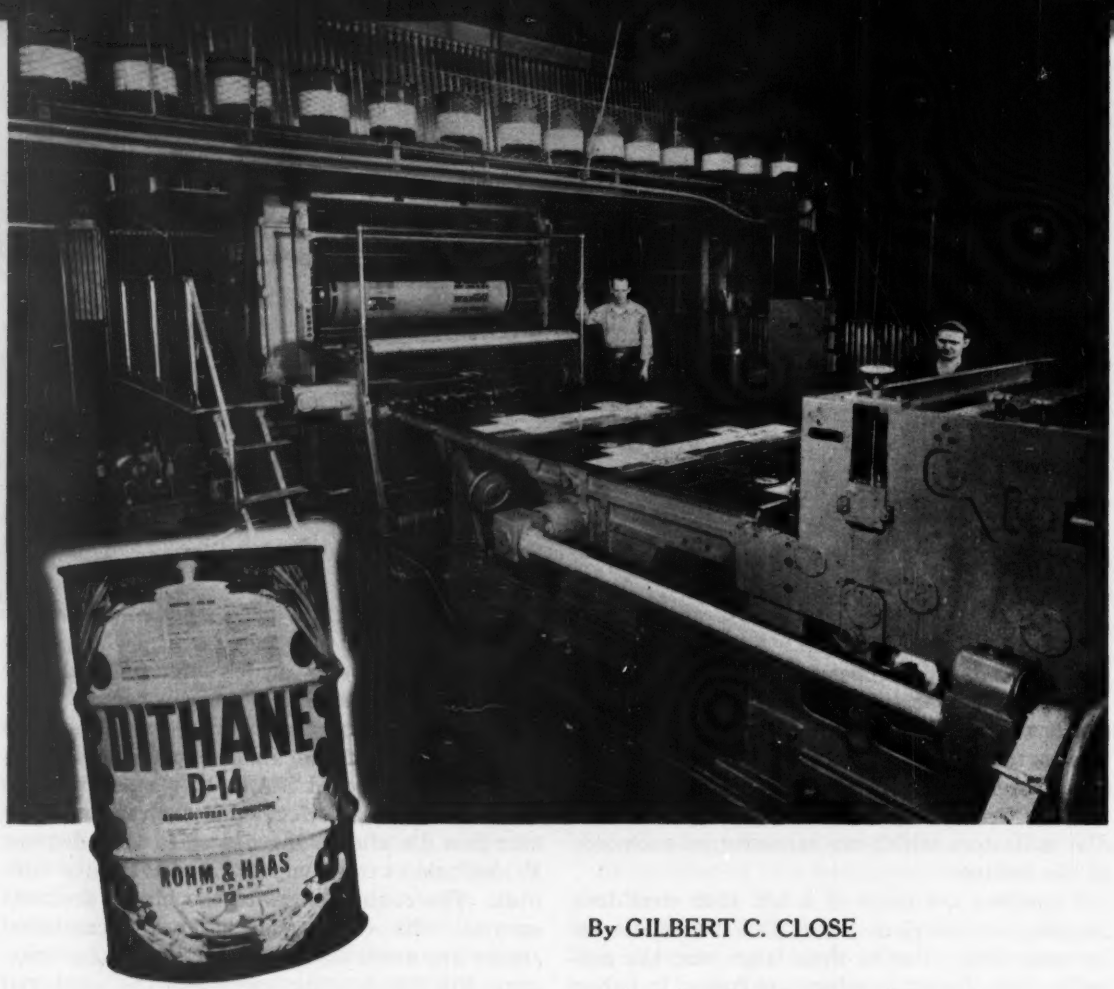


Fig. 3. Bridge gage employed on the special die set to provide a means of checking the contour of tooling at prescribed locations along the work.



By GILBERT C. CLOSE

Rheem Steel Drums Coated and Lithographed Before Forming

NEW finishing techniques for steel drums developed by the Rheem Mfg. Co. differ from the traditional method of drum finishing in that the coating for the inside of the drum is rolled on, and the advertising message is lithographed. These operations are performed while the drum sheet is still flat. Heretofore, the drums were first formed, then spray-coated, and the advertising was applied with a stencil or a silk screen. The "Rheemcoating" techniques offer much closer control over coating thickness, and the lithographed message captures far more detail and authenticity than was possible with a stencil or silk screen.

Rheem plants, which account for a sizable percentage of the steel drum market, have gone "all out" in streamlining production. A typical line, such as that at the South Gate, Calif., plant, has a capacity of more than six hundred 55-gallon drums per hour. The accompanying illustrations show some of the interesting stages in the transition of the flat sheet into the finished product.

Most sheet stock is purchased cut to size and requires no shearing. As a first step, the sheets are fed through a Wheelabrator for a series of automatic cleaning and conditioning operations. In Fig. 1 can be seen a stack of sheets ready to enter the machine. The sheets are picked up by a vacuum device and placed on the 38-inch wide belt of the Wheelabrator. Sheets as large as 42 by 74 inches can be accommodated. After the sheets are carried past wheels that blast off scale, rust, and other surface impurities, they progress through leveling rollers to obtain perfect flatness.

Next comes a water rinse, followed by a pass through squeegee-like drying rollers. A bond for the subsequent lacquer coating is applied by phosphatizing rollers, and the sheets are again

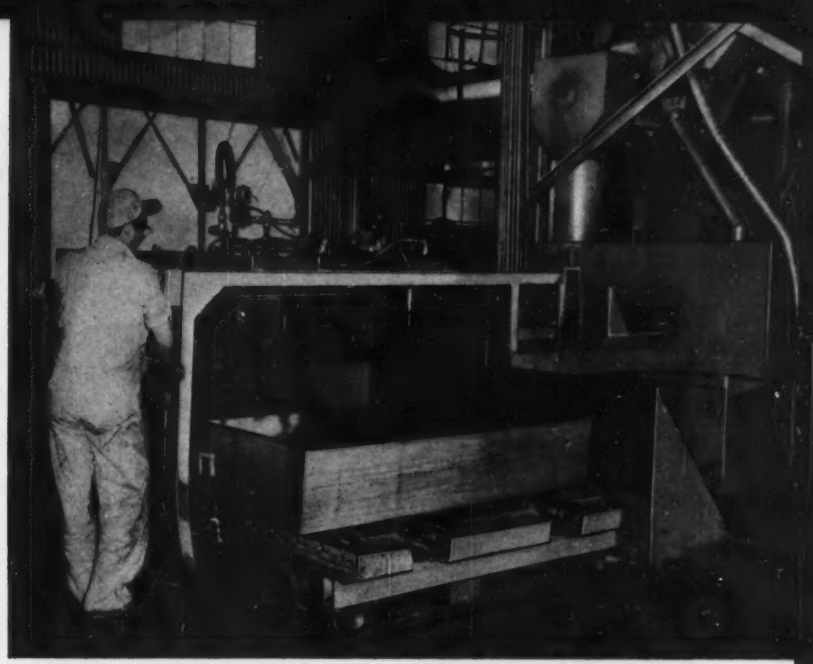


Fig. 1. Once on the belt of this Wheelabrator, the sheets start through a series of preparatory cleaning operations.

dried by a pass through a second set of drying rollers. Adjacent to the Wheelabrator is a machine which automatically stacks the sheets prior to transfer for the coating operation.

Roller coating is shown in Fig. 2. Because the coating thickness can be held to a tolerance of 0.001 inch, the drums are safe for bulk shipments of products. Much better thickness control is possible than could be maintained with the old spray-coating process. Vinyl lacquers are generally used for the drum interiors. These lacquers spread evenly, dry hard, and have proved to be chemically inert to the substances the drums are intended to contain. After roller coating, the sheets feed automatically onto the traveling racks of a 100-foot long drying oven, the entrance of which is visible at the right-hand side of the illustration.

As the sheets emerge from the oven, they are conveyed to an automatic loader behind the giant Hoe lithographing press shown in the heading illustration, where the desired message and design are printed. One of the largest metal decorating presses ever made, it leaves an accurate impression that is not distorted by the rolling hoops of the finished drum. Following

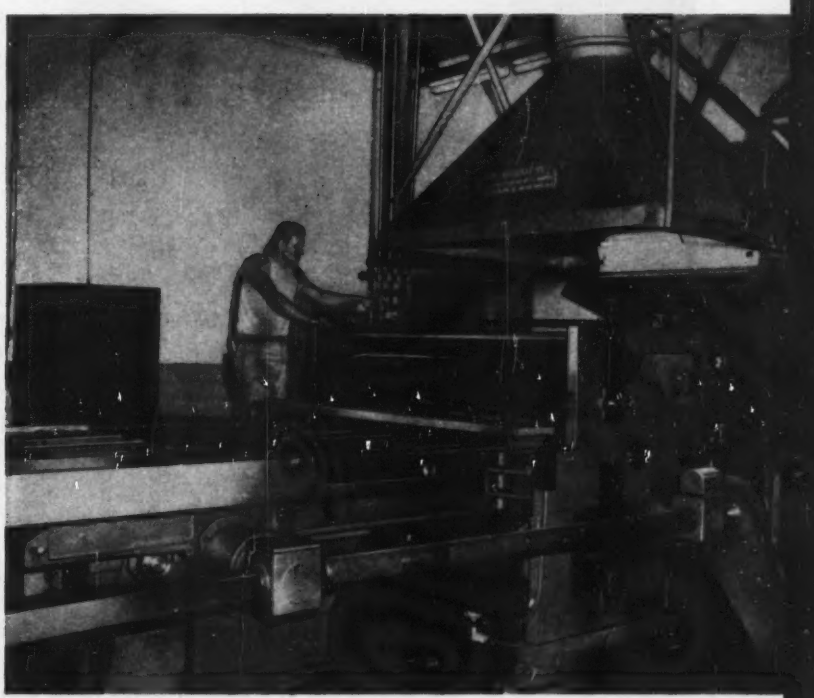


Fig. 2. In the roller coating operation, precision control of the coating thickness safeguards the contents of the drums from contamination.

Fig. 3. Printed sheet for a 55-gallon drum. Drums of 50- or 60-gallon capacity are made by varying the height, the drum diameter remaining the same.

lithographing, the sheets are returned to the drying oven. In Fig. 3 is shown a completed lithographed and dried sheet. The commonest sheet thicknesses processed are 16 and 18 gage. Some 25-gage sheets are now coming into use.

From the oven, the lithographed sheets enter the Federal welding and rolling machine illustrated in Fig. 4. (The particular drums shown in work were for military use and contained no lithographing.) Edges of the sheets are automatically ground smooth as they approach the machine. Immediately after welding, the area of the welding bead is descaled, phosphatized, and then painted to blend with the design of the rest of the drum.

Flanges on each end of the drums are flared by mandrels of the machine shown in the foreground in Fig. 5. The two central rolling hoops

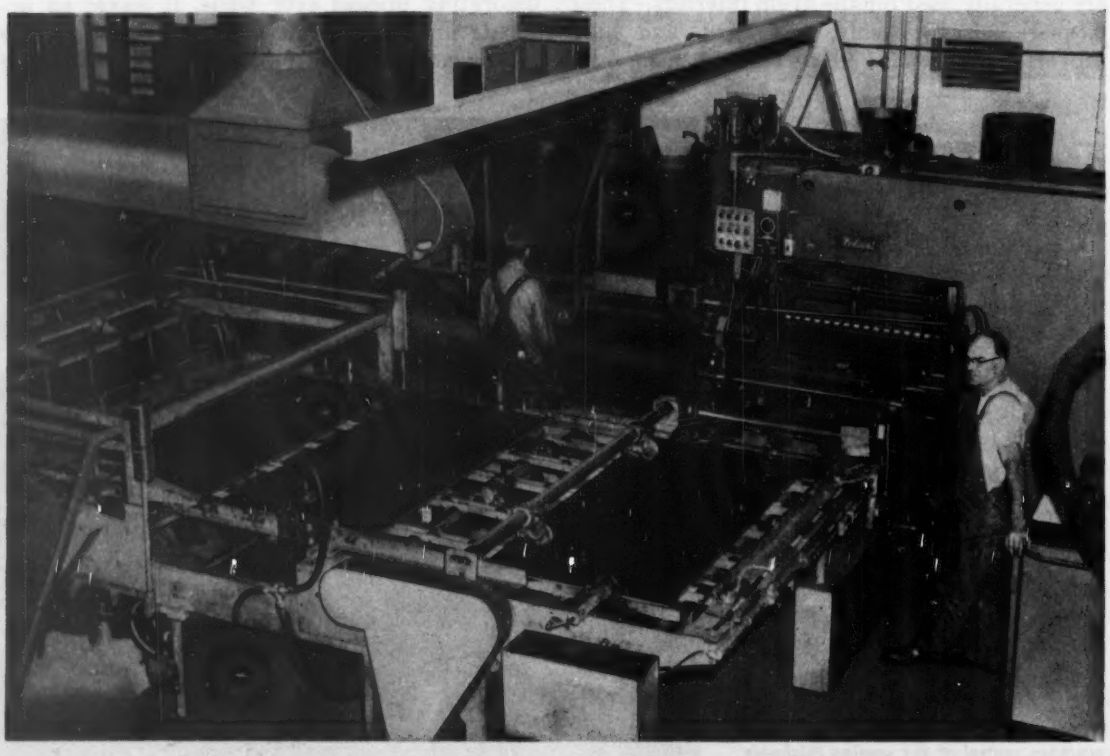


Fig. 4. After leaving the welding machine, the welding bead area is descaled and phosphatized by a series of narrow rollers prior to being sprayed.

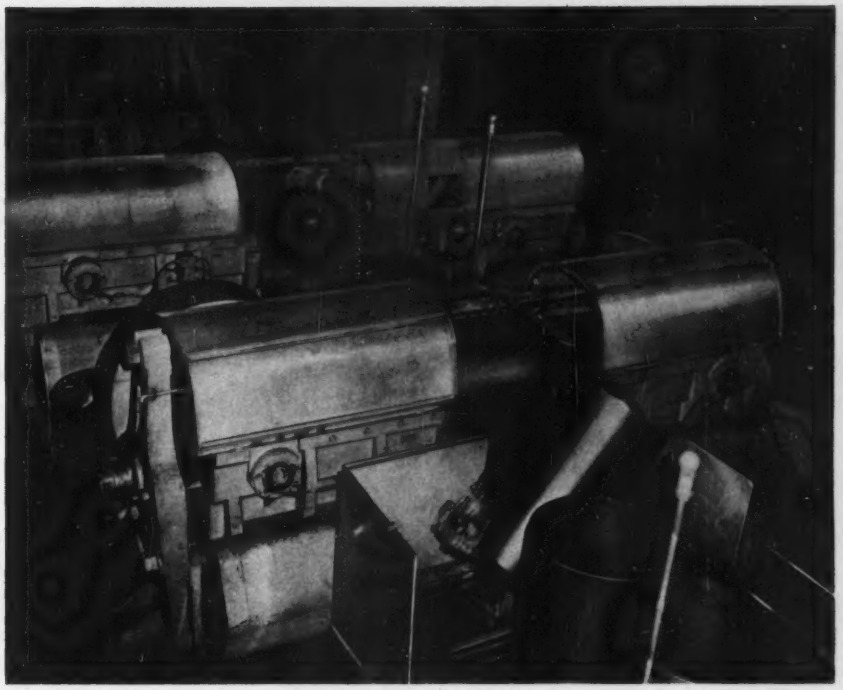


Fig. 5. Machine in foreground flares the flanges on the ends of the drums; machine in background then forms the two central rolling hoops. Illustrated drums are for military use, and so have no lithographing on them.

are formed when the drums advance to the machine in the background. An expanding segment in each of two dies simultaneously enters both ends of the drums. Then another machine, Fig. 6, swages the flanges around covers installed at the drum ends. Drums are considered complete at this point, and are air-tested with a pressure of 15 pounds per square inch. The drums that are being produced for the military services, have an additional reinforcing hoop swaged to each end.

A noteworthy feature of the entire process is the fact that the roller-coated and lithographed sheets are handled through to the completion of the drum without marring the glistening surface or obliterating any of the fine printing.

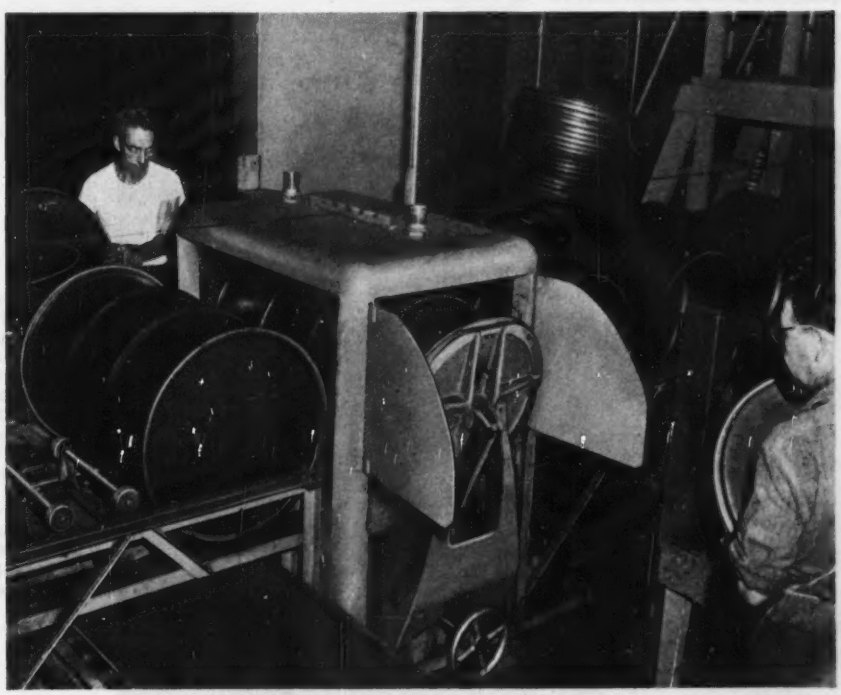
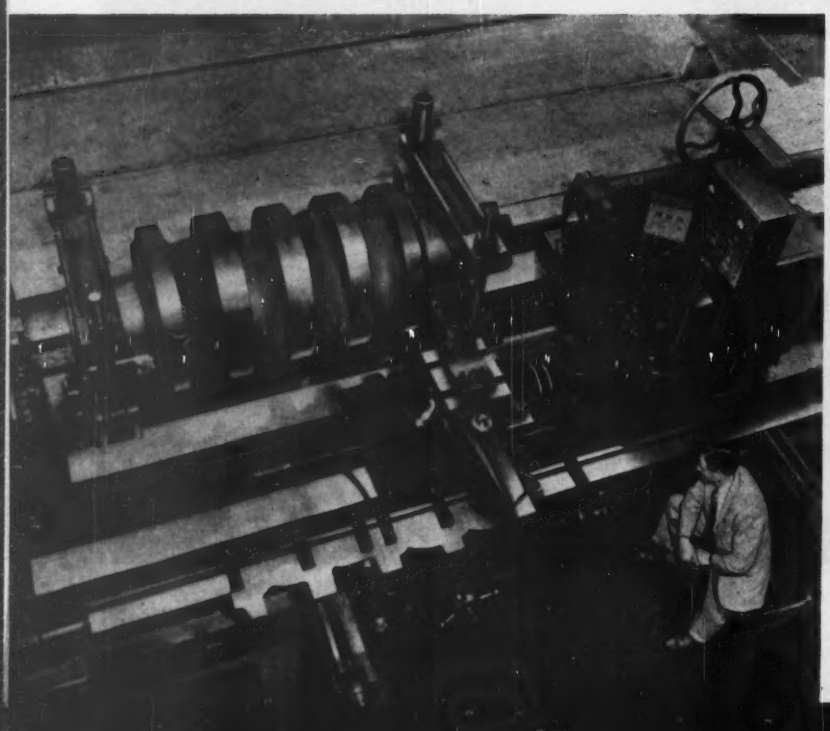


Fig. 6. Swaging the flared flanges over both barrel covers simultaneously is done on this machine following the forming of the rolling hoops.

In Shops Around the Country

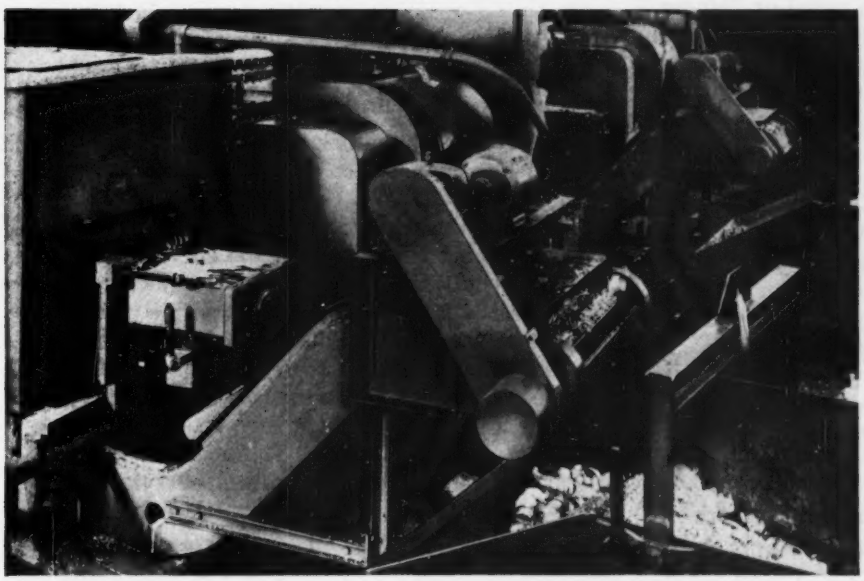
Camera highlights of some interesting operations performed in various metal-working plants throughout the nation

Forging one of the eighteen steel column sections for a 50,000-ton Loewy press at the Bethlehem, Pa., plant of the Bethlehem Steel Co. Five forging heats are required to elongate the cylindrical billet to a rectangular "dumbell," the fourth operation being illustrated. The column section, already grown to 70 feet in length, has a finished length of 110 feet. It is claimed that these forgings are the longest ever made. Special supporting equipment prevents the work from sagging because of its plasticity at forging temperature. Following forging, heat-treatment takes an entire week in a special 120-foot furnace. When assembled at North Grafton, Mass., next year, the press will produce airframe components for the United States Air Force.

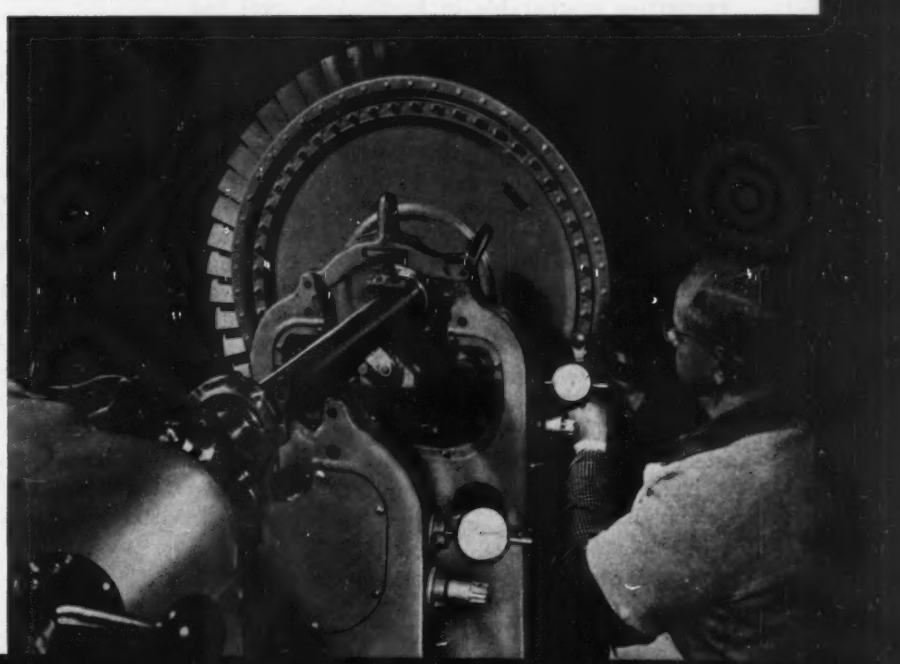


Entirely automatic contour-duplicating is performed on this giant 60-inch Mackintosh-Hemphill roll-turning lathe recently installed in the Homestead, Pa., roll shop of the United States Steel Corporation. For the first time on a lathe of this size, all-electronic duplicating equipment is used to control the cutter. Both the template and the cutter can be observed from the carriage by the operator. The control panel and Raytheon electronic equipment are mounted on the right-hand side of the carriage. Signals from a stylus moving along the edge of the template are amplified in the control panel, interpreted, and fed to two electric motors.

Jet-engine parts being produced to close accuracy on a Lodge & Shipley "T" lathe and checked with Webber heavy-duty over-size gage-blocks. Inspection of these parts can be made without removing the work from the machine. Since most of the inspections are critical, the manner of joining the blocks is an important consideration in their design. They are held together with eccentric clamps that provide a rigid build-up without excessive pressure. Sets of these blocks can measure work of any size. Accuracy of block assemblies is within 0.000005 inch.



"Chip-Tote" automatic scrap removal conveyors speed production at the Coit Road Works, Cleveland, Ohio, of Thompson Products, Inc. The conveyors are made by May-Fran Engineering, Inc., of the same city. They continuously remove large volume of chips generated by Sundstrand automatic lathes, eliminating periodic shutdowns for manual scrap removal. The receiving end of the "Chip-Tote" is located directly beneath the lathe tooling. Chips fall on a hinged-steel belt and are carried up an incline to waste boxes. Perforations in the belt permit the coolant to drain to the sump in the base of the lathe. An integral motor and gear reducer drive the belt.



Balancing an engine-cooling fan for a helicopter at the Piasecki Helicopter Corporation, Morton, Pa. Equipment used is an industrial balancer made by the Bear Mfg. Co., Rock Island, Ill. H-21 fan assemblies are statically and dynamically balanced to within 2 inch-ounces at 1050 R.P.M. In addition, the balancer checks the track of the fan assembly. The 12-foot bed length of the unit permits drive-shaft assemblies to be dynamically balanced within 1 inch-ounce at 1050 R.P.M., with a 60 per cent saving in time over a previous method.

Materials OF INDUSTRY

The properties and new applications of materials used in the mechanical industries

Titanium Carbide with Nickel "Binder" Resists Elevated Temperatures

A cemented titanium carbide with small percentages of tantalum and columbium carbides, using nickel as an auxiliary metal or "binder," has been developed and is being sold under the trade name "Kentanium" by Kennametal, Inc., Latrobe, Pa. The new alloy resists oxidation at 1600 to 1800 degrees F., and has a specific gravity range of from 3 to 4, a high hardness (Rockwell A 83 to 93), and an elastic modulus, or rigidity factor, about twice that of steel.

Pre-sintered ingots of this material have enough strength for handling and machining. Large symmetrical round shapes can be turned in a lathe with diamond-tipped tools. Complex shapes can be ground with abrasive wheels. The material is used for parts subjected to elevated temperature service, such as turbine blades and nozzle vanes in gas turbines and jet engines.

Copper-Clad Hardenable Steel for Highly Conductive Spring Parts

A highly conductive material with spring properties comparable to hardenable steel has been announced by the Metals & Controls Corporation, General Plate Division, Attleboro, Mass. "Conflex copper-clad hardenable steel," as the material is called, is a composite metal consisting of a layer of medium-carbon steel with a relatively thin layer of electrolytic copper clad to one or both sides. Advantages attributed to this material are low cost, high electrical and thermal conductivity, good ductility for extreme forming, desired spring properties after heat-treatment, resistance to corrosion, and ease of electroplating.

Flexibility in electrical conductivity is obtained by varying the thickness of the copper layers. It is manufactured with the copper and steel in various thickness ratios. Widths up to 8 inches and thicknesses from 0.050 inch down are available.

This composite metal is supplied in a soft condition for fabrication. Spring characteristics are obtained by heat-treating the parts. Hardening and tempering procedures are similar to those used for solid hardenable steel.

Stick Form Lubricant for Blind-Hole Tapping

"Hypertap," a blind-hole tapping lubricant of solid stick form, has been introduced by Destiny Products Co., 2970 W. Grand Blvd., Detroit 2, Mich. This stick lubricant permits the use of finishing or bottoming taps at the very start of the thread-cutting operation, and is reported to facilitate the tapping of holes to within 1 1/2 threads of the bottom, without the necessity of backing out of the hole to remove chips. The stick, equal in diameter to the hole being tapped, contains a cutting oil which serves as a coolant in the tapping operation. The compound envelops the chips and carries them out via the flutes of the tap as the compound is displaced by the tap.

These sticks are stable in storage and will withstand temperatures up to 100 degrees F. If subjected to greater temperatures, they will soften, but can be stiffened quickly by immersion in cold water. Sticks are now available in diameters ranging between 9/64 inch and 1 inch in standard lengths of 3 1/2 and 7 1/2 inches.

Hardening Compound Suitable for Low-Carbon Steels

A powdered compound to harden low-carbon steels has been marketed by the Armor-Tuf Sales Corporation, 299 Madison Ave., New York 17, N. Y., under the name Armor-Tuf. In use, the part to be treated is heated, covered with the compound, and quenched, thus imparting a high surface hardness and wear resistance. Advantages indicated are lack of toxic fumes and relatively low heating temperatures.

Three Types of Hollow Tool Steel Bars Now Available

Hollow bars of tool steel have been placed on the market by the Crucible Steel Company of America, Chrysler Bldg., New York 17, N. Y. These hollow bars of tool steel were designed to facilitate the fabrication of ring-shaped parts which are now being cut out of solid bars or special forgings. Manufacturers of can dies, trim dies, liners, ring gages, and similar products are expected to comprise the market for this product.

The hollow tool steel bars are furnished with a machined surface and hole. The fabricator thus does not have to machine central areas. Three tool steels are now available in hollow form: Airdi 150, an air-hardening type; Ketos, an oil-hardening type; and Sanderson, a water-hardening steel. Warehouse stocks of hollow tool steels range from 2 inches round with a 1-inch hole to 16 inches round with a 12-inch hole.

Resin Eliminates Clay Balls from Foundry Sand

A resin that eliminates clay balls from foundry sand, thereby improving sand workability, has been brought out by the Plastics Division, Monsanto Chemical Co., Springfield, Mass. Lustrex 886, as the resin is called, facilitates uniform packing and eliminates most of the cracks, fissures, and soft spots characterizing untreated sands.

It is said that 1 pound of the new material produces uniform clay distribution in 1 ton of foundry sand. Since only about one-sixteenth of the resin is burned out each time the sand is used, only this amount must be added to a ton of sand whenever it is recycled.

Acidic Compound for Derusting and Descaling Operations

An acidic compound to be used for the removal of oxide and scale from steel has been announced by Enthone, Inc., 442 Elm St., New Haven, Conn., (Department M). The product, called Enthone Descaler 2A, is available in a dry powder form, and is used in concentrations ranging from one to several pounds per gallon with temperatures ranging from 70 to 180 degrees F., depending upon the speed of descaling desired and the type of scale. It dislodges oil films, promotes fast pickling, and gives white clean surfaces after descaling or derusting.

The product may be used for tumble or barrel derusting or descaling, for removal of rust or scale in vats or tanks, for primary pickling, or for plating cycles. A layer of foam that forms on the pickling solution practically eliminates fumes, thus making the pickling or descaling operation safe to the operator and reducing corrosion on surrounding equipment.

Improved Flux for Use in Silver Brazing Operations

An all-purpose flux compound for use in silver brazing operations has been developed by the American Platinum Works, Newark 5, N. J. The product, designated No. 1200, is intended for application with silver solders in the brazing of ferrous and non-ferrous metals.

The flux melts at a temperature lower than the melting points of the alloys employed, and forms a coating of fused salts over the brazing area. It performs three functions: covers the work and the brazing alloy, thus preventing oxidation of the surface during heating, brazing, and cooling; cleans and floats off dirt or oxides; and reduces surface tension of the molten alloy, causing it to flow freely over the work surfaces that have been heated to brazing temperature. The flux coating is easily removed after brazing by washing with water.

Hammer Finish Enamel has Uniformity of Pattern

Development of a new type of hammer finish enamel—which is easy to apply and which has uniformity of pattern—has been announced by the Monroe Sander Corporation, 10-18 46th Ave., Long Island City, N. Y. It is known as "Sanco Hammer Finish," and is applied by spray methods. Available in a wide variety of colors, the Sanco finish bakes rapidly, is chip- and scratch-resistant, and, because it covers imperfections with only one coat, does not require the use of a primer.

Dry Lubricant Developed for Metal-Forming Operations

A dry lubricant for use in metal-forming operations has been announced by the Gilron Products Co., 6007 Euclid Ave., Cleveland 3, Ohio. Called Drawcote, this lubricant is applied to the metal by dipping or spraying, and when it is dry forms an odorless, non-inflammable protective and lubricating film. Once coated, stock can be stored for long periods and then used as desired. It is easily removed from formed parts by a hot mild alkali bath.

Press Dies Cast from Plaster Forms

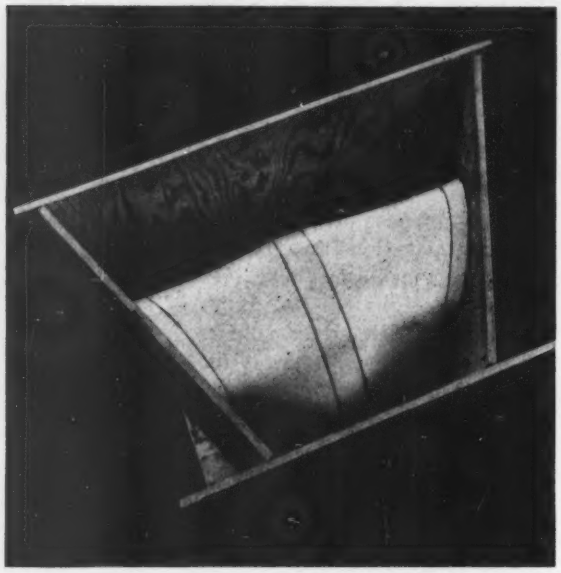


Fig. 1. After coating with shellac thinned with alcohol, the screeded mock-up is placed in a wooden frame.

By
HOWARD COPE and HARVEY LANDIS
Aircraft Gas Turbine Division
General Electric Co.
Lockland, Ohio

KIRKSITE dies cast from plaster forms are being used by the General Electric Co. in the manufacture of jet engines as a quick and economical method of producing sheet-metal parts for experimental purposes. Pouring molten Kirksite into molds made from plaster forms enables craftsmen to make both members of the die set in substantially less time than with conventional wooden patterns, since plaster forms can be readily constructed from a screeded mock-up of one member of the die set.

Screeding consists of attaching a template of the desired contour to a sliding support and pushing it through a plastic mass of gypsum plaster mixed with water. What is obtained is a strip of plaster of constant cross-section. If the shape is intricate, simple component parts of the mock-up can be screeded separately, then glued together. The mock-up is identical in appearance to the mate of the form being made. Whereas the form is hollow, the mock-up is a solid piece of plaster and has little strength because of its built-up construction.

To make the finished form, the mock-up is coated with shellac thinned with alcohol and placed in a wooden frame, as can be seen in Fig. 1. This frame corresponds to the flask used in the foundry. Any cracks in the joints of the frame can be sealed with modeling clay. The exposed surfaces of the mock-up and the inner walls of the frame are coated with a parting compound, such as green soap, then splashed with plaster to a thickness of 1/2 inch.

Next, upholsterers' sisal dipped in plaster mix is placed against the splashed plaster surfaces until a thickness of 1 1/2 inches is obtained. To handle the form, two metal rods are set trans-

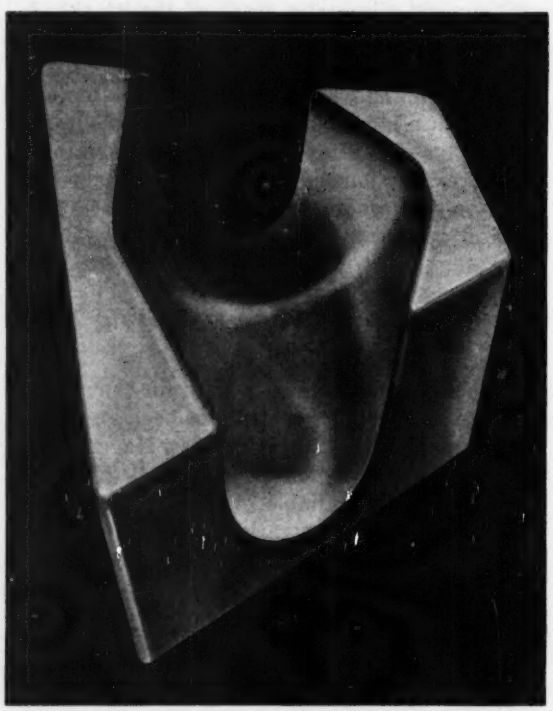


Fig. 2. Female plaster form after it has been lifted off the mock-up

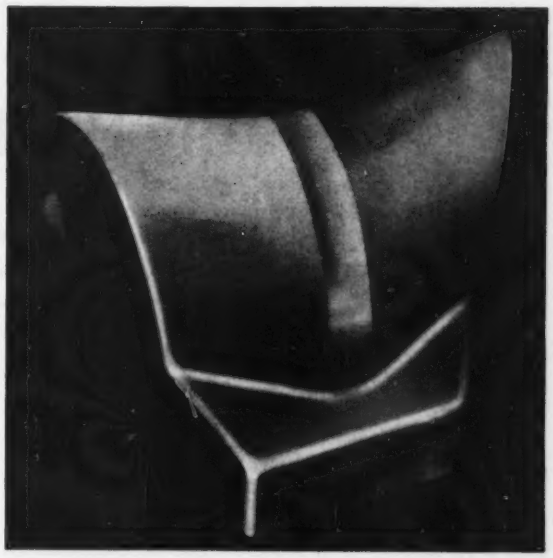


Fig. 3. This male form was molded directly from the female form.

versely in the plaster, in the two hollows between the frame and the mock-up. The frame is then removed, and when the heat of crystallization has started to increase, the form can be lifted off the mock-up. In the illustrated case, the female form is being made first. It is shown completed in Fig. 2.

To obtain the mating male plaster form, the female form just constructed replaces the mock-up in the frame and the original steps are repeated—shellacking, applying the parting compound, splashing the plaster, applying the sisal, inserting the rods, and removing the frame. After lifting the male form, it is sealed.

The foundry can now ram and pull the plaster forms to make the molds for the Kirksite. By pouring both halves of the die set from the same melt, uniform shrinkage of both castings is assured. In addition, both castings will cool at the same rate. This is significant, for as soon as the castings are cool enough to handle, they are placed together and struck a few blows in the drop-hammer. This technique eliminates much of the finishing otherwise required.

Resin Coating Eliminates Dust Hazard from Concrete Radiation Shields

A thin coating of resin protects the cosmotron (an $8,000,000 machine being used to study basic facts about the atom) at the Brookhaven National Laboratory, Upton, N. Y., from damage by abrasive particles dislodged from the massive concrete radiation shields that surround it. These radiation shields consist of a series of 10-ton concrete blocks stacked four tiers high, and are used to protect the scientists who are working at controls and with experimental equipment from radiation emanating from the cosmotron during operation.

Because the cosmotron is a delicate piece of machinery, it is necessary to keep the 200-foot long room that houses the machine virtually dust-free. One of the problems is preventing the concrete shielding blocks, which are occasionally moved, from causing dust.

The problem is solved by employing Vibrin, a product of the Naugatuck Chemical Division, United States Rubber Co., New York City. A 1/32-inch coating of Vibrin seals the cement blocks with a hard, glasslike surface, thus eliminating the concrete dust problem. This resin is used because it does a good sealing job, produces a coating that will not flake off under a weight of 40 tons, and is quick drying. The resin is applied by spraying.

Grinding Carbide Tools with Electrolytically Assisted Diamond Wheels

As a possible means of conserving diamond bort, the research and development department of the Norton Co., Worcester, Mass., has been engaged for some months in evaluating electrolytically assisted diamond-wheel grinding of cemented carbide—a process sometimes referred to as "electrolytic grinding." This is a method of stock removal wherein conventional diamond-wheel grinding is assisted by simultaneous electrolysis of the cemented carbide.

The work-piece, which is positive in a direct-current electric circuit, is separated a minute amount from the metal bond of the diamond wheel, which is negative, a suitable electrolyte flowing between them. The diamond particles act both as an abrasive to remove stock in the conventional manner and as effective non-conducting spacers to prevent metal-to-metal contact between the work and the metallic diamond wheel bond during electrolysis.

* * *

Cleanliness is so important in miniature ball bearings produced by the New Departure Division of General Motors that no human hand is permitted to handle or even touch one during the process of manufacture.

Designing Hopper Feeds for Bottle Caps

Fifth in a series of articles describing developments in mechanisms for automatically feeding bottle caps to production machines

By JOSEPH and VINCENT WAITKUS

TWO means of controlling the cap feed are provided in the hopper and feeding mechanism for bottle caps to be considered in this fifth article of a series. The mechanism is somewhat like the type of hopper feed described in the first article (June, 1952, page 180), but it embodies many new features.

Referring to Fig. 1, there is a hopper *A* with the usual plate *B* for cutting off the cap supply, and the hinged clean-out door *C* held in place by the latch *D*. A fluted roller *E* constitutes the first means for obtaining cap control in the hopper. The fluted roller is driven by the belt *F* which connects pulleys *G*. The rotation of the roller at a steady speed controls the feeding of caps into the revolving chamber so that the caps are discharged in small numbers, which may be increased by slowing up the rotation of the roller or augmenting the number of flutes on the roller.

The revolving chamber consists of two dish-shaped members *H* and *I* fastened together and keyed to the hollow shaft *J*. The pin-wheel *K* is fastened to an independent shaft *L* passing through the hollow shaft *J*. Each shaft is provided with a pulley *N*, and is so mounted that the two shafts can be rotated independently. This form of construction permits regulation of the speed of the revolving chamber relative to

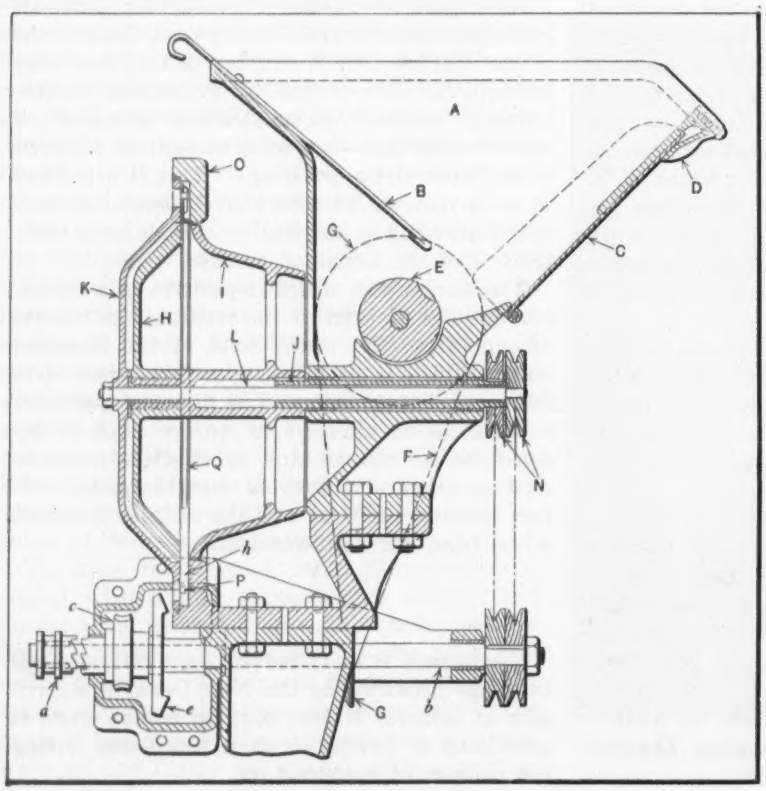


Fig. 1. Cross-section through hopper and driving members of bottle-cap feeding mechanism shown in Fig. 2

the pin-wheel K, and also permits changing the direction of rotation of the pin-wheel relative to the revolving chamber.

In one case, it was found that best results were obtained when the pin-wheel K was rotated in the opposite direction to the revolving chamber and at the same speed as the chamber. It was observed that there was then a minimum amount of churning and agitation of the caps, and that they were removed rapidly from the chamber by the pin-wheel.

The pin-wheel K is provided with ordinary straight pins P. A housing ring O and the guide ring Q are provided to form a chamber for the caps. The ring Q is fastened to the housing ring O and serves to guide the caps until they pass out to the open cap-rectifying chute R, Fig. 2. This chute is a very clever though simple device. It is provided with ribs which, aided by the fact that the location of the center of gravity of the cap causes it to fall upward, serve to place all caps in one position on the disc S. A cover T prevents the caps from flying out of the chute before they reach the point to which they are being directed.

After reaching the horizontal disc S, which revolves continuously in its housing, the caps have about completed their passage. Centrifugal force throws the caps to the inner edge of the housing. From here they are directed to the chute U, seen in Fig. 3, which conducts them to the machine below.

It is apparent that some means must be provided to control the flow of caps from the pin-wheel K to the disc S. This is taken care of by an electrical arrangement consisting of contactors V, which are fastened to the disc cover W. One of these contactors is provided with the finger X which extends through a slot in the disc cover so that it can come in contact with the caps passing under the cover W. A solenoid Y, Fig. 2, placed in a circuit provided with energy from the factory power system, completes the electrical equipment.

The plunger of the solenoid Y is attached to one end of the rocker arm Z. The other end of the rocker arm is shaped into a yoke and provided with two pins which fit into a groove machined in the clutch member a, Figs. 1 and 2. This clutch member is attached to the shaft b by means of two keys, thus permitting a sliding motion for the clutch a under the action of the

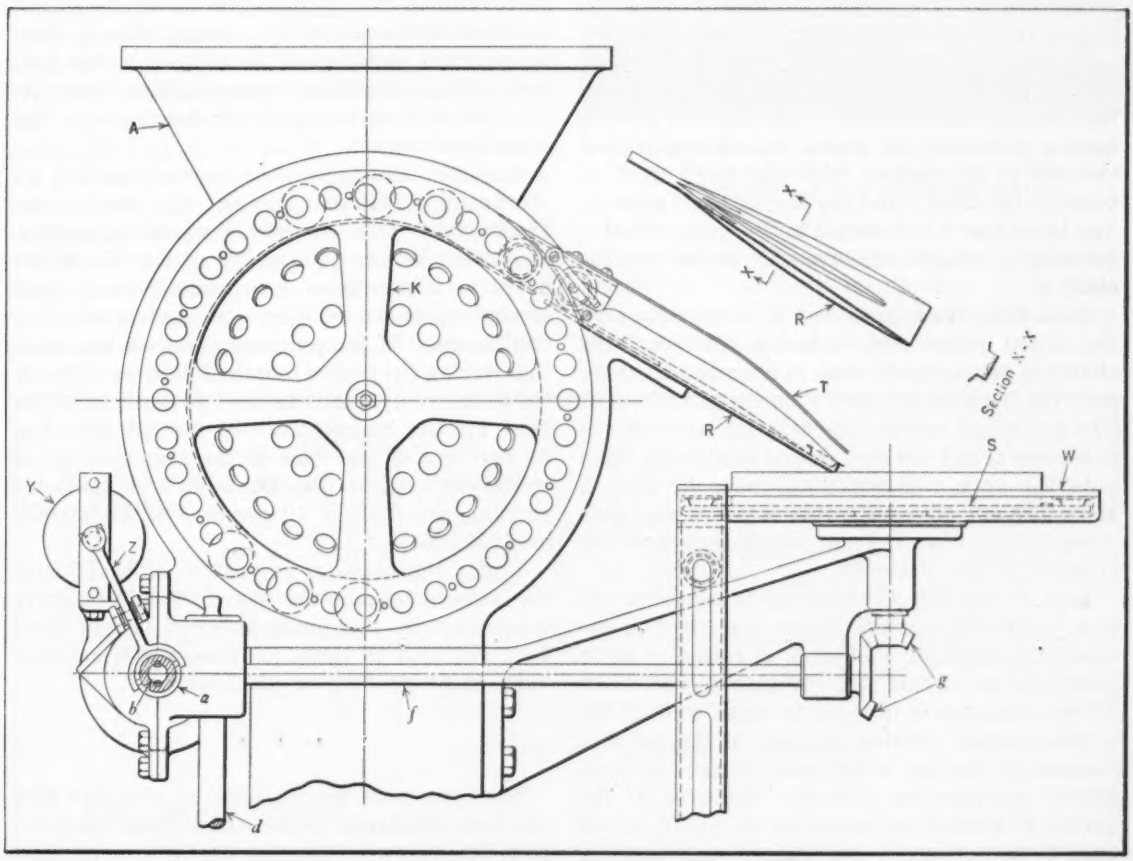


Fig. 2. Hopper mechanism for feeding bottle caps to production machines

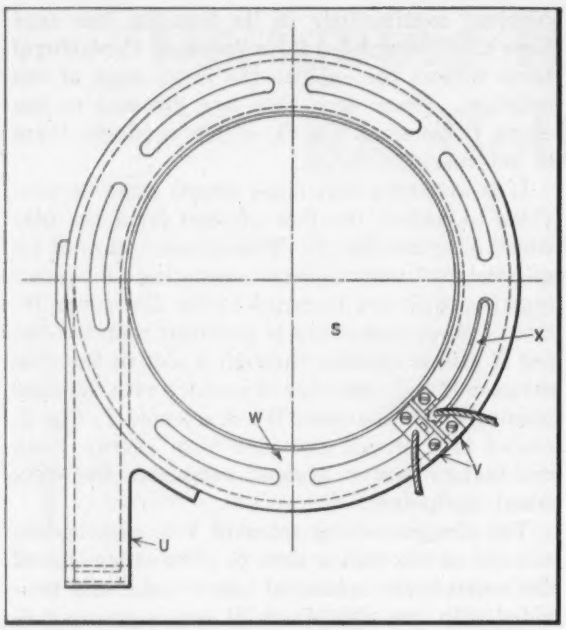


Fig. 3. Plan view of disc (S), Fig. 2, showing finger (X) that completes electrical circuit, stopping feed when disc (S) becomes overloaded due to clogging of machine

rocker arm *Z*. The second member of the clutch is part of the worm-wheel *c*.

The entire hopper receives its power from the shaft *d* through a worm not shown in the drawing, and the worm-wheel *c*. The disc *S* is rotated from a pair of bevel gears, one of which (not shown) is in contact with the bevel gear *e*, through the shaft *f* and the pair of bevel gears *g*. The bevel gear *e* is fastened to the worm-wheel *c*, forming a single unit free to rotate on the shaft *b*.

Caps from the hopper *A*, Fig. 1, pass through the fluted roller and, entering the revolving chamber, immediately drop to chamber *h*, where they fall between the pins *P* on the pin-wheel *K*. The pin-wheel carries the caps up between the guide-bar *Q* and the ring *O*, and discharges them onto the open cap-rectifying chute *R*, Fig. 2. Here they are all made to face upward and slide down to the disc *S*, from which they are discharged to the chute *U*.

Now, if the disc *S* is crowded to capacity, due to a jam in the machine below, the feeler of the electrical contactor *V*, Fig. 3, is raised so as to complete the circuit and energize the solenoid. If the contactor is allowed to make contact for a short period, nothing happens at the solenoid because of the lag in the time it takes to completely energize the solenoid. However, if the period of contact is continued, as would be the case if there were a full line of caps passing under the feeler *X*, the solenoid becomes effective.

Upon being energized, the solenoid plunger is drawn in, causing the clutch members to be separated through the rocker arm *Z*. This immediately stops the rotation of the pin-wheel *K*, the revolving chamber, and the fluted roller. The disc *S* remains in rotation because it is actuated by the gear *e*, which is fastened to the worm-wheel *c* and is in continual rotation from the shaft *d*. Churning action in this mechanism was reduced to a great extent in the revolving chamber through the use of reverse rotation and the elimination of the pin arrangement used in the hopper described in the first article.

The final installment of this series will describe a mechanism designed for bottle caps twice the normal size of those for beer bottles.

* * *

Renegotiation Act Amended to Authorize Percentage-of-Use Segregation Methods

The Renegotiation Board has just announced amendment of Part 1456 of the 1951 Renegotiation Regulation Act. The new ruling provides that, as to subcontracts for new durable productive equipment, manufacturers may apply percentage-of-use segregation methods (that is, whether the use is for renegotiable or non-renegotiable production) in addition to the Section 106(c) fractional renegotiation formula. The following example illustrates the way the amendment works:

A seller, employing the accrual method of accounting, delivers during its fiscal year $1,000,000 worth of new durable productive equipment having an average useful life of ten years to a purchaser who manufactures both combat cars for military use and trucks for civilian use. If the purchaser advises the seller that during the twelve months following delivery the entire equipment was used 40 per cent of the time for the manufacture of combat cars and 60 per cent of the time in the manufacture of trucks for civilian use, the seller's renegotiable accruals are 5/10 of 40 per cent of $1,000,000, or $200,000.

Under the previous regulation of the Board, the manufacturer of the new durable productive equipment in the example given would have been required to show as renegotiable accruals 5/10 of $1,000,000, or $500,000.

* * *

Steel one-tenth the thickness of a human hair has been developed by the Armco Steel Corporation, Middletown, Ohio, for use in a secret electronic device.

Accurate Centering of Projectiles Insures Precise Turning

THE problem of center-drilling forged 81-millimeter howitzer shells concentrically with the bore and holding the drilled center depth closely in relation to the bottom of the shell cavity was solved by one manufacturer through the application of the equipment here shown. This equipment consists of a Lo-Swing automatic centering machine built by the Seneca Falls Machine Co., Seneca Falls, N. Y.

Shells are accurately located and held on a six-jaw air-operated expanding driver, details of which are given in Fig. 2. Three jaws near the open end of the shell are positively operated by a draw-bar extending from an air cylinder. Three additional jaws which expand near the closed bottom end of the shell are operated by a heavy spring within the driver and compensate for variations in the rough shell bore.

In operation, the work-head spindle revolves at a slow speed while the center drill rotates at the proper drilling speed. This combined rotation of the work and drill insures accuracy in center-drilling hollow parts. To facilitate loading and unloading of the work-head, the latter swivels into position shown at left in Fig. 1.

The operating cycle of this equipment is completely automatic. The uppermost push-buttons seen above the centering head at the right are used for starting and stopping both the work-head and centering-head motors. The two push-buttons arranged in a horizontal line just below control the work-head movements. A vertical feed-lever and its locking cylinder are located at the front of the centering head.

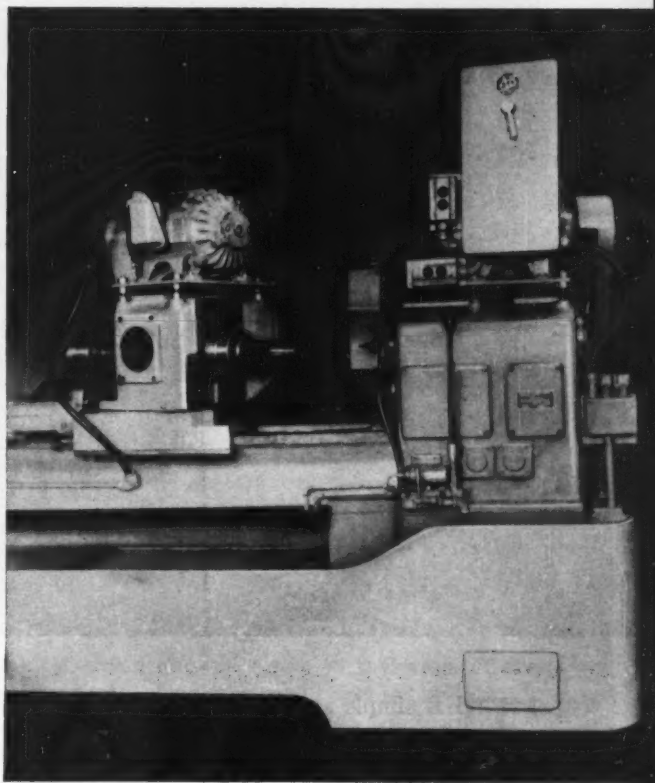


Fig. 1. Automatic machine for center-drilling howitzer shells within a degree of accuracy which insures close-tolerance turning in a subsequent operation.

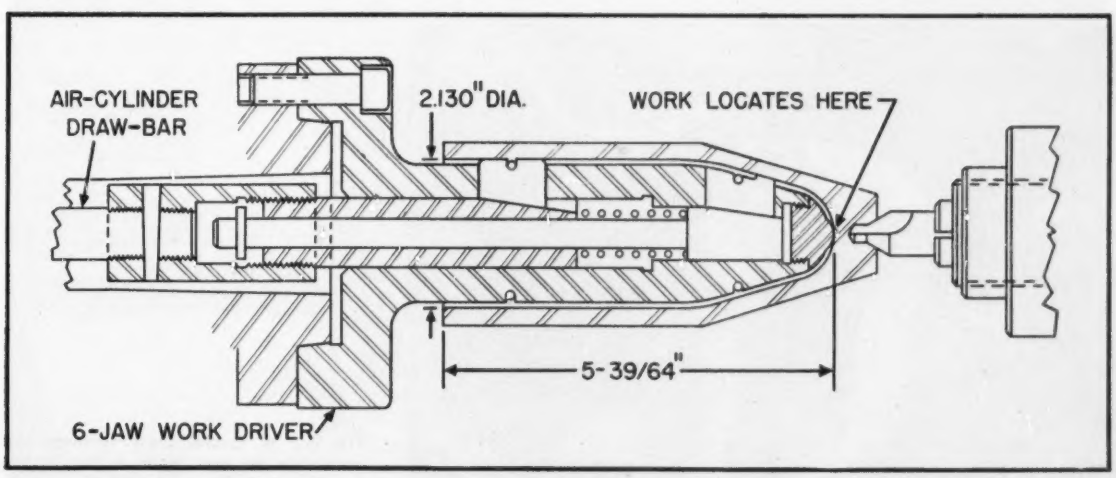


Fig. 2. Details of the six-jaw work driver provided for the automatic projectile center-drilling machine.

Douglas Mass-Produces Plastic Airframe Parts

By GILBERT C. CLOSE

Fig. 1. The honeycomb blocks are carefully laid up by hand to strengthen walls of the component. These blocks are held to a thickness tolerance of 0.010 inch.

THE simple and routine manner in which major components of airplanes are being fabricated of plastic is illustrated by these views of the plastic department of the Douglas Aircraft Co.'s El Segundo, Calif., Division. Now busy producing plastic noses for the United States Air Force F-3D "Skyknight" intercepter and plastic radomes for the Navy AD "Skyraider" attack bomber, the department has been able to operate on a full production basis without any extraordinary investment in new equipment or in a personnel training program.

Typical plastic fabricating procedure is first to construct a plaster dummy of the component using loft information. From the exterior of the dummy are lifted various molds required for the construction of the part. The inner surface of the molds is coated with a releasing compound. Ordinarily the molds are made of metal, but for short runs a thin phenolic shell can be substituted. All of the high-precision surface requirements of the finished part must be present in the molds.

Because of its good dielectric properties, the

Fig. 2. A special chair supports the worker in the nose while laying up the inner glass cloth lining over the honeycomb blocks.

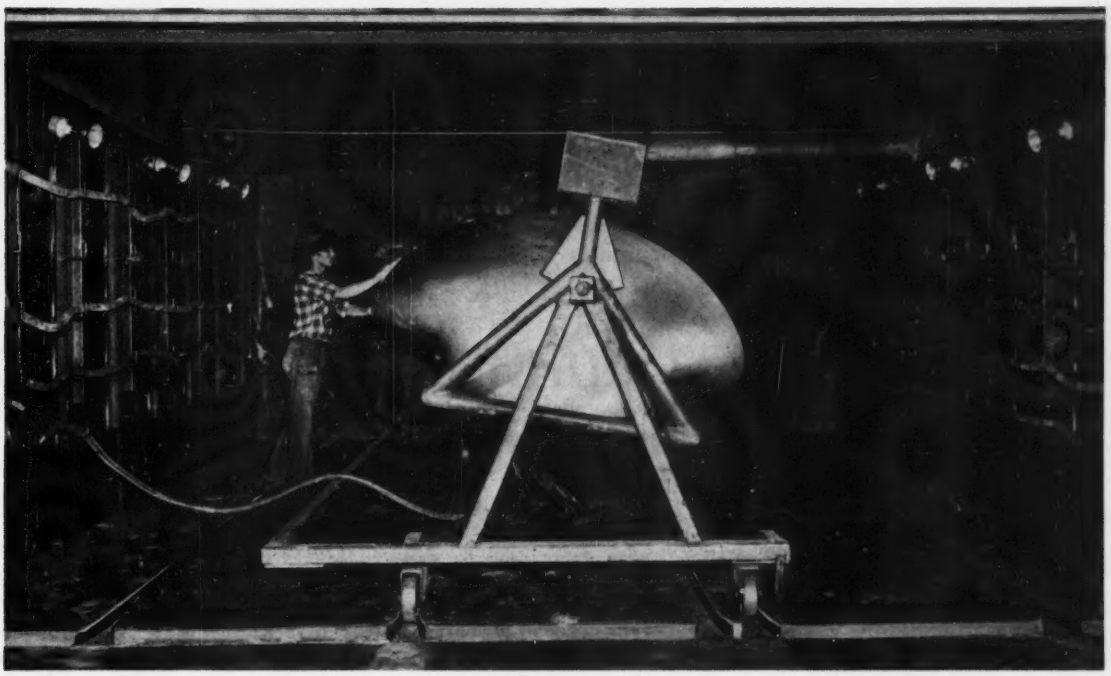
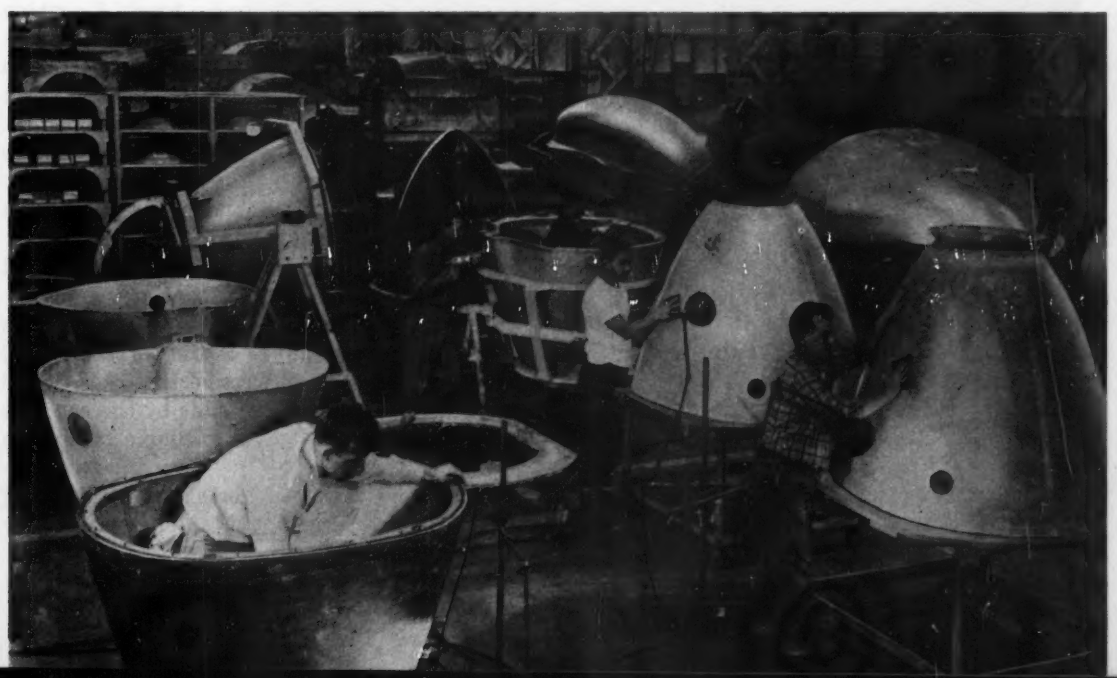


Fig. 3. This radome is a "guppy" which houses all flight radar equipment.

plastic of which the component is made is a polyester type resin. After being catalyzed, it is used to impregnate sections of glass cloth which have been precut to the dimensions of the mold. The impregnated cloth is then laid up in the mold to form the outer surface, or skin, of the finished part.

While the resin in the glass cloth is still wet, honeycomb blocks of plastic are next laid up to add strength and thickness to the walls of the component. This step is illustrated in Fig. 1. Blocks are arranged so that their joints are staggered. Filler pieces of the impregnated glass cloth are then laid up on the honeycomb blocks in all "attach" areas. An entire inner lining of the cloth is next applied, as shown in Fig. 2. Over this lining is placed a layer of cellophane, the purpose of which is to separate the wet plas-

Fig. 4. Noses (foreground) are made in one piece; whereas radomes (background) are made in two pieces which are sealed together.



tic from a vacuum bag which is applied in a subsequent operation.

The bag, made of Pliofilm, is stretched over the work, sealed around the edges, and the air beneath it is then evacuated until a vacuum of 10 to 15 pounds pressure per square inch is obtained. The atmosphere thus impinges on the surface and creates the necessary forming pressure. While under vacuum, the work is cured in an oven at 225 to 250 degrees F. A "Skyraider" radome which is attached to the under side of the airframe is shown in Fig. 3 supported on a trunnion fixture in a curing oven.

Many of the noses and radomes are ready for painting immediately after curing. Others may, as in Fig. 4, require some surface sanding, or a coating of filler, or completion of certain drilling operations prior to the painting.

Adjustable-Stroke Driving Mechanism for Reciprocating Slide

By W. M. HALLIDAY

THE unusual lever driving mechanism shown in the accompanying diagrams was designed to replace an ordinary connecting-rod arrangement used to impart a reciprocating motion to a machine slide. This slide, indicated at *H*, was an essential part of a wrapping machine and had to be driven by a constantly revolving shaft in the machine. Adjustments in the length of the reciprocating stroke of the slide and in the position of its working movements within the stationary machine guideways were frequently necessary.

In some cases, no appreciable difference was required in the length of travel of the slide, but its working position had to be varied in order to operate the slide in a retracted position. In others, the stroke length had to be changed to obtain a greater amount of travel, in addition to locating the slide in a slightly different working position in its guideways.

When making adjustments with the original equipment, it was necessary to stop the machine, sometimes three or four times in succession, before obtaining the correct amount of slide travel or proper positioning of the reciprocating slide in its guideways. With the new drive, provision was made for obtaining adjustments without interfering with the machine drive in any way. The mechanism for the control was designed to accomplish its purpose in a quick and safe manner.

Referring to Fig. 1, member *A* is the driving shaft which rotates in a horizontal bearing *B*, an integral portion of the machine frame. Shaft *A* is driven at a constant speed of rotation in a clockwise direction by a simple spur gear drive (not shown) at the rear of bearing *B*.

To the front end of shaft *A* is keyed a cast-iron circular disc *C*, which carries the projecting crankpin *D* fastened in place by a lock-nut at the rear of the disc flange. The crankpin is immovable in the disc and cannot be adjusted to obtain variations in the length of stroke as in the original drive. Mounted on the crankpin is the connecting-rod *E*, this being retained in the correct endwise position by the mild-steel collar *F* cross-pinned to the projecting end of the crankpin. The connecting-rod swivels freely over the pin, but with only sufficient endwise movement to give normal working clearance for proper functioning.

A connecting-rod *G*, which in this case is identical with *E* in size and in the distance between the fulcrum pin holes, is linked at its right-hand end to the reciprocating slide *H* by pin *K*. This end of the rod fits easily within the vertical slot *I* machined in the boss *J* on the end of the slide.

Slide *H* moves in the horizontal plane within the stationary dovetail guide track *L*, which may be integral with the machine frame *M*, or a separate bracket. Linking the two free ends of rods *E* and *G* is arm *N*. This member has a slot *O* at its lower end wide enough to admit both connecting-rods. All three members are joined by fulcrum stud *P*.

Slot *O* should be deep enough to permit an ample degree of independent swiveling movement for both connecting-rods. The upper end of arm *N* is attached to the front of the adjustable slide *R* by a fulcrum stud *Q*, which prevents the arm from moving out of the correct lateral position relative to the connecting-rods. Stud *Q* is secured in place in the slide by the headless screw *S* which is seated in a dimple or spot in the stud.

Slide *R* is T-shaped, being stepped down along the top of each long side. It is closely

fitted within the long parallel guideway *U* machined in the bracket *V* secured to the machine frame. This guide track is located perpendicularly to the dovetail track *L* carrying slide *H*. The vertical axis *X*–*X* passes through the center of stud *Q* carried in the slide.

The slide is prevented from lifting out of guideway *U* by two plates *W*, situated one at each side and bearing lightly on the stepped portions of the slide. Each plate is secured to the bracket *V* by three cap-screws. The slide should be a close fit within its guideway. It is locked in any desired vertical position by means of the lever type locking screw *a* threaded into a tapped hole in the left-hand side of the guide bracket, and tightened against the side of the slide.

Slide *R* is actuated by the fine-pitch lead-screw *b* which threads into the phosphor-bronze full nut *c* in the base of groove *d*. This groove is machined on the under side of the slide in order to give clearance for the lead-screw. The upper end of the lead-screw is guided in the fixed bearing plate *e* fastened to the top of the guide bracket. A handwheel *f* is keyed to the projecting upper end of the lead-screw, so that it may easily be rotated. The top surface of the retaining plate *W* at the right-hand side has the accurately measured graduations *g*. The small pointer *h*, fastened on top of slide *R*, is set adjacent to the graduation marks to facilitate setting the slide.

All connecting-rods, their fulcrum pins, and slide *R* should be of hardened steel, smoothly ground or polished, and precision-fitted, to prevent undue slackness and to safeguard against wear. The mechanism was designed for performing light-duty work, and operates the driven slide *H* at forty-two strokes per minute, with a length of travel ranging from 3.75 inches to 4.375 inches. The working position of this slide, however, had to be varied up to 1 1/8 inches.

Operation of the drive mechanism will be readily understood by referring to Fig. 1, which shows the positions of the various members when the driven slide *H* is about to commence its forward stroke to the right, with crankpin *D* passing over the dead-center point at the left. With the slide at this terminal point, it will be observed that the vertically disposed slide *R* is locked at a point well down in its guideway *U*, at such a point in fact, that the arc described by the center of stud *P* at its lower end will be tangent with a horizontal plane passing through the axis of the driving shaft *A*. Arm *N* will thus swing at a radius equal to dimension *Y* from the horizontal plane. This setting allows the two connecting-rods *E* and *G* to lie practically in axial alignment with each other, and almost in the horizontal plane.

As shaft *A* rotates in a clockwise direction from the position indicated, its movement will be transmitted to the slide *H*, after the usual fashion; but arm *N* will swing radially about fulcrum stud *Q*. At the setting here shown the

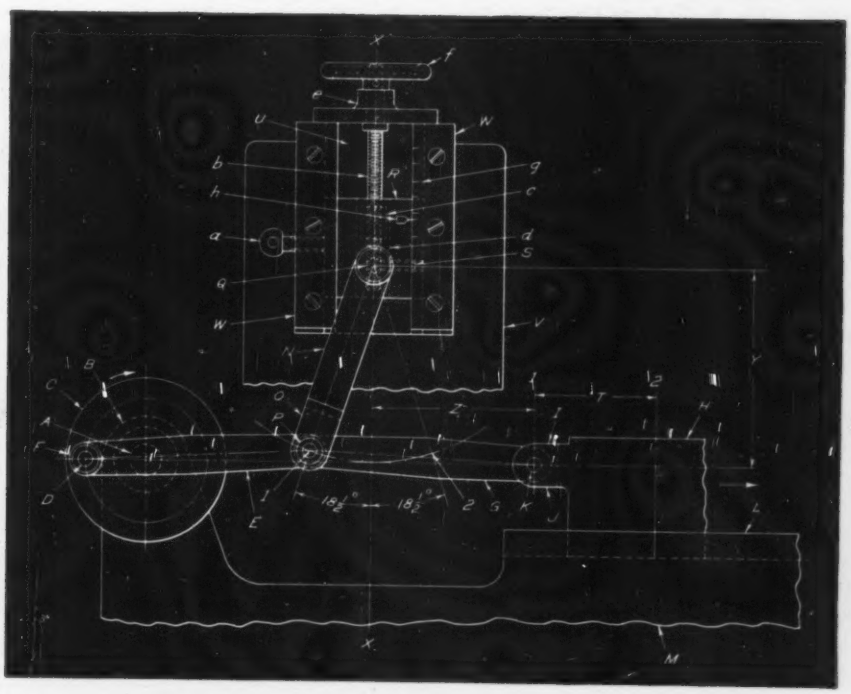


Fig. 1. Adjustable-stroke driving mechanism for reciprocating slide set for minimum stroke length of slide (H).

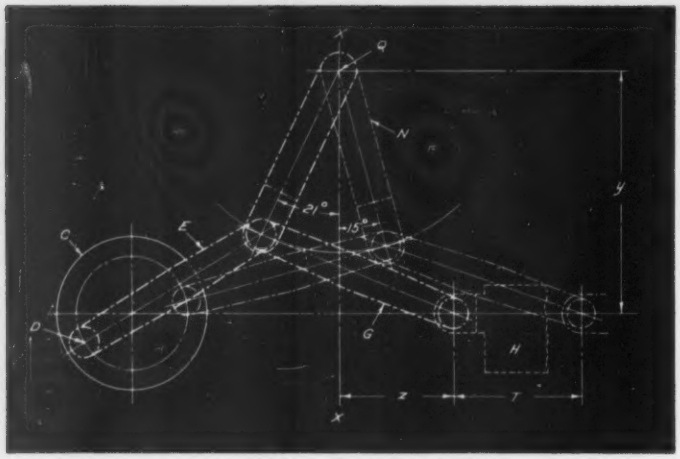


Fig. 2. Diagram of mechanism shown in Fig. 1 adjusted for maximum stroke length of slide (H) but with slide operating in a different position.

arm moves an equal distance (18 1/2 degrees) each side of the vertical axis *X–X*.

When arm *N* has been swung from position 1 to 2, the driven slide will likewise have moved to its maximum forward position at 2, thus having traveled distance *T*, which in this case is 3.75 inches. This setting gives almost the shortest length of stroke on the slide.

The position of the slide movements in guideway *L* will also be disposed at the maximum distance *Z* to the right of the vertical axis *X – X* with this setting. Thus slide *H* will be made to operate in its most advanced point to the right.

The diagram in Fig. 2 shows the manner in which members of this mechanism will be disposed to each other when adjusted to the longest stroke setting for the slide *H*. With this setting, slide *R* and stud *Q* have been raised the maximum height *y* above the horizontal center line, this distance being exactly 1 inch greater than dimension *Y*, Fig. 1. Further upward travel of slide *R* will be arrested by the bearing plate *e* in which the lead-screw is held, so that a positive stop is provided for its adjustment in this direction.

Arm *N* will swing at the same radius about its fulcrum stud *Q*, causing the two connecting-rods *E* and *G* to occupy the positions shown when the crankpin *D* is passing over the left-hand dead-center point. The effect of raising the slide *R* and arm *N* a distance of 1 inch will be to draw slide *H* substantially to the left, so that the starting point of its outward stroke will be located a distance *z* from the vertical axis *X–X*.

With the lengths of connecting-rods *E* and *G* proportioned to the length of arm *N* as shown in Figs. 1 and 2, the distance *z* will be at a minimum with the slide *R* adjusted to the highest possible position as indicated in the diagram, Fig. 2. With this adjustment, distance *z* is 1 1/8 inches less than distance *Z* indicated in Fig. 1, where slide *R* is adjusted to its lowest position. It will also be noted that arm *N*, Fig. 2, swings through a slightly smaller angle, 36 degrees, which is not now equally disposed each side of vertical axis *X – X*, traveling 21 degrees to the left, but only 15 degrees to the right of axis *X – X*. In this diagram, the heavy broken lines show the positions of the rods, etc., when slide *H* is commencing its forward stroke to the right; the light dot-and-dash lines indicate their relative positions when it has reached the end of its stroke.

Adjustment of slide *R* to any position between the two extremes illustrated may be effected while the mechanism is in motion. The engagement of the lead-screw with the slide will prevent that member shifting in its guideway despite release of locking screw *a*. The handwheel attached to the lead-screw is so located as to afford access for adjusting slide *R* as required.

By turning the lead-screw a small amount, fine adjustments can be made in the length of travel, or the position of slide *H*. This slide need not necessarily reciprocate in the horizontal plane. Operation will be equally effective with this slide moving vertically or along an inclined guideway track, provided slide *R* is arranged to move at right angles to the motion of slide *H*.

By means of graduation marks *g* on plate *W* and pointer *h*, it is possible to instantly reset slide *R* a predetermined height *Y* so as to give slide *H* a stroke of given length. In designing this mechanism to give a larger range of slide movements, it will be desirable to insure that arm *N* and the two connecting-rods have sufficient length to permit the former member to swing approximately an equal amount each side of the vertical axis.

TOOL ENGINEERING *Ideas*

Tools and fixtures of unusual design and time- and labor-saving methods that have been found useful by men engaged in tool design and shop work

Punching Die Unit Designed to Facilitate Handling Deep Shells

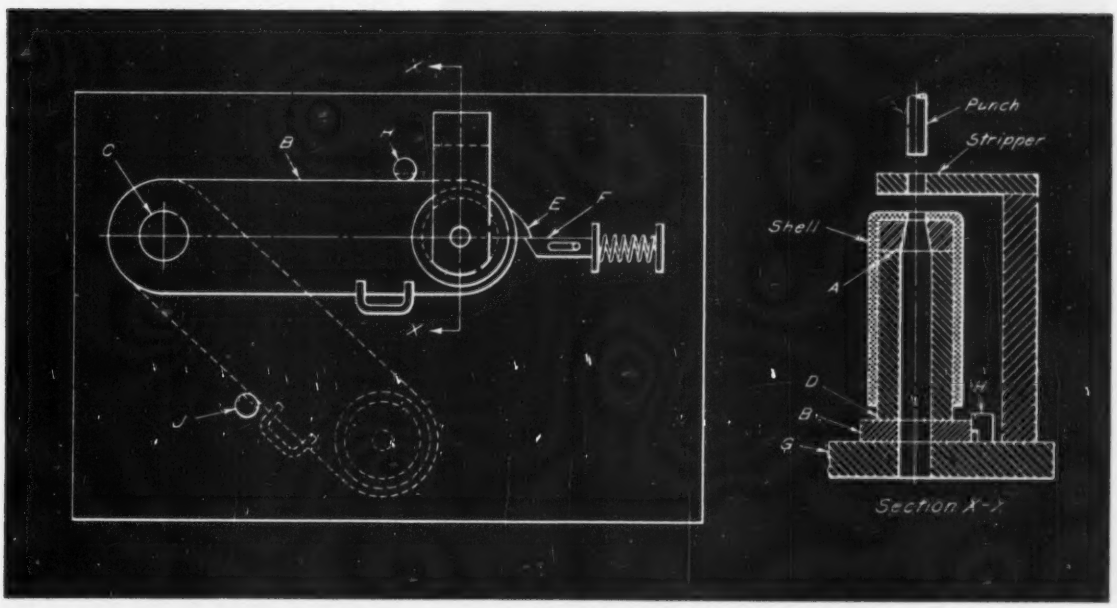
By FEDERICO STRASSER, Santiago, Chile

When holes are to be punched at the bottom of deep shells, it is necessary either to use a press with a very high shut height and a very long stroke or to provide special equipment to do the work. Since such presses are not generally available—particularly in the low capacities usually required for shell-bottom punching—suitable punching dies must be provided.

The interesting feature of the die developed for punching the hole at the bottom of the shell shown in cross-section *X–X* in the illustration is the movable die member *A*. This die is mounted on a spacer tube *D* which, in turn, is mounted on an arm *B* that swings about a strong pivot pin *C*. At the end of arm *B* is an inclined plane *E* which engages a spring-actuated latch *F* mounted on the die-bed *G*. Latch *F* serves to hold arm *B* in place against the stop-pin *H* during the hole punching operation, insuring accurate location of the die *A* in the proper working position during the down stroke of the press ram.

Operation of the die is very simple. The arm *B* is swung into the loading and unloading position (shown by dotted lines) against stop *J*, where the shell is put on the die *A*. Then the arm is swung into the working position against the stop *H*.

This stop is relieved somewhat next to the die-bed *G* to eliminate trouble from misalignment due to the accumulation of dirt between it and the arm *B*. With the arm locked in place by latch *F*, the hole is punched in the shell. The arm is then swung out, the punched shell unloaded, and the whole working cycle is repeated on the next shell.



Die unit with swing-out member designed for punching hole in bottom of deep shell shown in the cross-section view at the right

Plate Jigs Locate Drilling Operations from Hole in Work

By W. M. HALLIDAY, Birkdale, Southport, England

When a plate jig is employed in production drilling operations, it must be attached securely to the work by some means in order to insure accuracy. If the work possesses a hole around which the drilling is to be done, such as the rim of a cup that is to be drilled for a bolt circle, the plate jig can often be designed to locate the work from the internal wall of the cup. Plate jigs with built-in, quick-acting clamping arrangements and suitable locating provisions are here shown.

In Fig. 1 is a cross-sectional drawing of a plate jig *A* for a large casting *B*. This jig is fitted with bushings *C* which guide a drill in forming holes *D* in the irregular flange *E*. Prior to drilling, the deep cylindrical core *F* of the casting was machined.

Into a counterbore *G* on the under side of the plate jig—which is the same diameter as the machined core—is a close-fitting plug *H* retained in position by cap-screws *J*. A shoulder *K* on the plug extends a short distance into the core. For the greater length of its body, the plug is reduced in diameter to receive a compression spring *L* and a split ring *M*. The outside diameter of the ring is machined to a sliding fit with the core, and its inside diameter is tapered to correspond to the conical point of the plug. Both the plate jig and the plug are drilled through to accommodate a bolt *N*, the head of which seats the ring. Along the bolt is a keyway *O* engaging a pin *P* which serves to keep the bolt from turning.

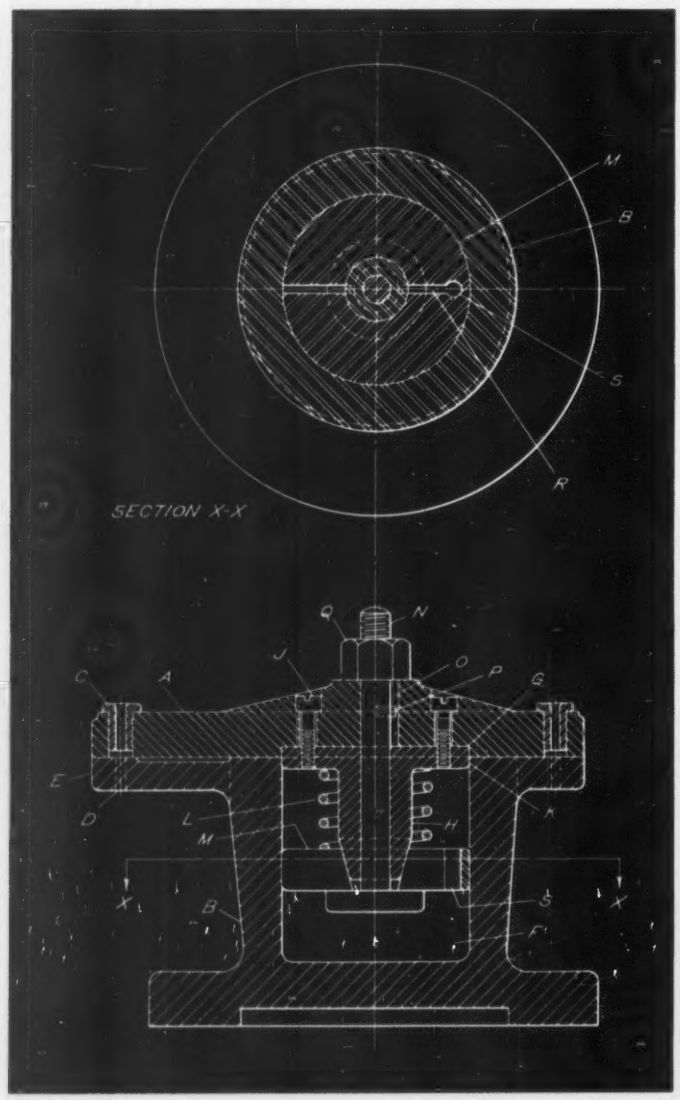


Fig. 1. The upward movement of the ring (M) over the plug (H) secures the jig to the work.

Upon loosening the nut *Q* on the bolt, the plate jig is placed over the work and automatically centralized by the fit of the larger diameter of the plug in the top of the core. By then tightening the nut, the ring is drawn upward against the pressure of the spring. The split design of the ring permits it to expand diametrically as it rides up over the cone of the plug, thus producing an effective grip against the wall of the core. In section *X–X*, it can be seen how the split permits the ring to expand. The split *R* is milled almost completely across the ring, to a small hole *S*. When drilling has been completed, the nut is loosened and the pressure of the spring forces the ring downward, contracting the outside diameter of the ring to its initial sliding fit with the core.

For drilling castings having relatively shallower and larger machined cores, either cylindrical or tapered, the plate jig can be designed as seen in Fig. 2. In this instance, the plate jig *A* is used for a casting having a tapered core. It is counterbored at *B* to receive the end diameter *C* of the plug *D*. The large diameter *E* of the plug, tapered to correspond to the core, has four cross-drilled holes, 90 degrees apart and square to the wall of the core. Rods *F* are contained in these

holes, with which they are a sliding fit.

Both ends of the rods are rounded. The inner ends enter a deep counterbore *G* in the bottom of the plug. This counterbore affords clearance for the conical section *H* of the bolt *J*. The rods are made to identical over-all length, which is calculated so that they will be in contact with the core wall when their inner ends bear against a point near the smallest diameter of the conical section of the bolt, as shown.

Tightening the nut *K* draws the bolt upward to compress the spring *L* and force the rods radially outward to grip the casting. Conversely, loosening the nut permits the bolt to drop, and the rods release their grip. To prevent the rods from falling out of the plug when the plate jig is removed from the work, each rod is provided with a slight flat along one side. These flats do not quite extend to the ends of the rods. Intersecting the flatted areas are holes containing pins *M* which serve to limit the movement of the rods.

This style of plate jig can be made to locate a drilling operation from a cylindrical machined core by having the four cross-drilled holes in a horizontal plane; in other major respects its design will be similar. Also, this plate jig permits a greater variation in the core diameters of duplicate work-pieces than is possible with the plate jig shown in Fig. 1.

A third design, ideal where a plate jig has to be centralized over a rough core, is illustrated in Fig. 3. Both the plate jig *A* and the plug *B* are drilled 1/16 inch larger than the diameter of the bolt *C*, so that the latter can have a certain amount of sidewise movement. The bottom of the plug is recessed to form a rounded lip *D* which serves as a fulcrum for a set of four fingers *E*. These fingers are pinned at *F* in milled slots in the head *G* of the bolt.

Leaf springs *H* attached to the lower end of the bolt support the fingers against the lip at an angle in the free position of the jig. When the bolt is drawn upward, the fingers are caused to pivot slightly around the lip and grip the core wall. Any out-of-roundness of the core will be compensated for by a sidewise movement of the bolt as it is tightened. When the bolt is loosened, the springs raise the fingers.

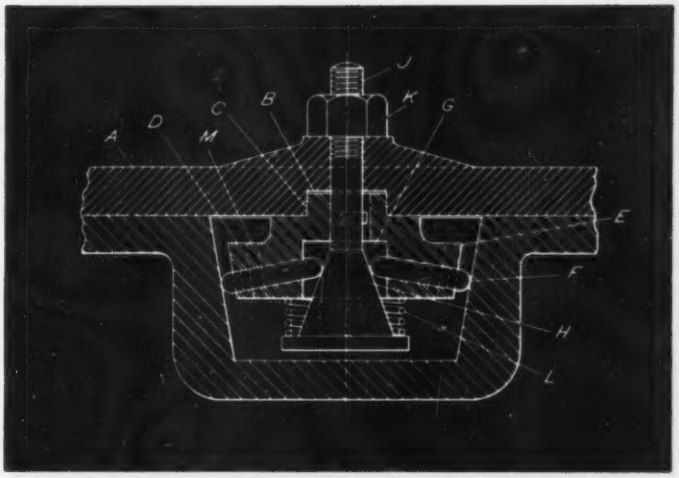


Fig. 2. The cone (H) of the bolt directs the rods (F) radially outward to grip the wall of the core.

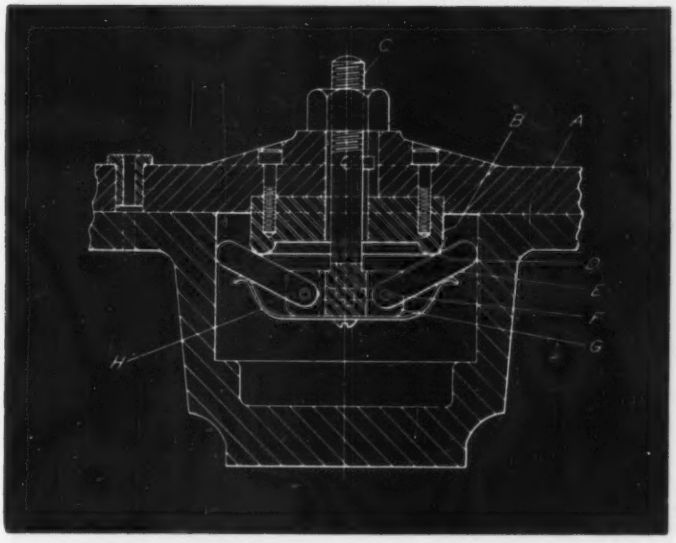


Fig. 3. As the bolt (C) is drawn upward, the fingers (E) pivot around the lip (D) to bear against the core wall.

Quick-Acting Fixture Holds Balls Accurately for Milling Operation

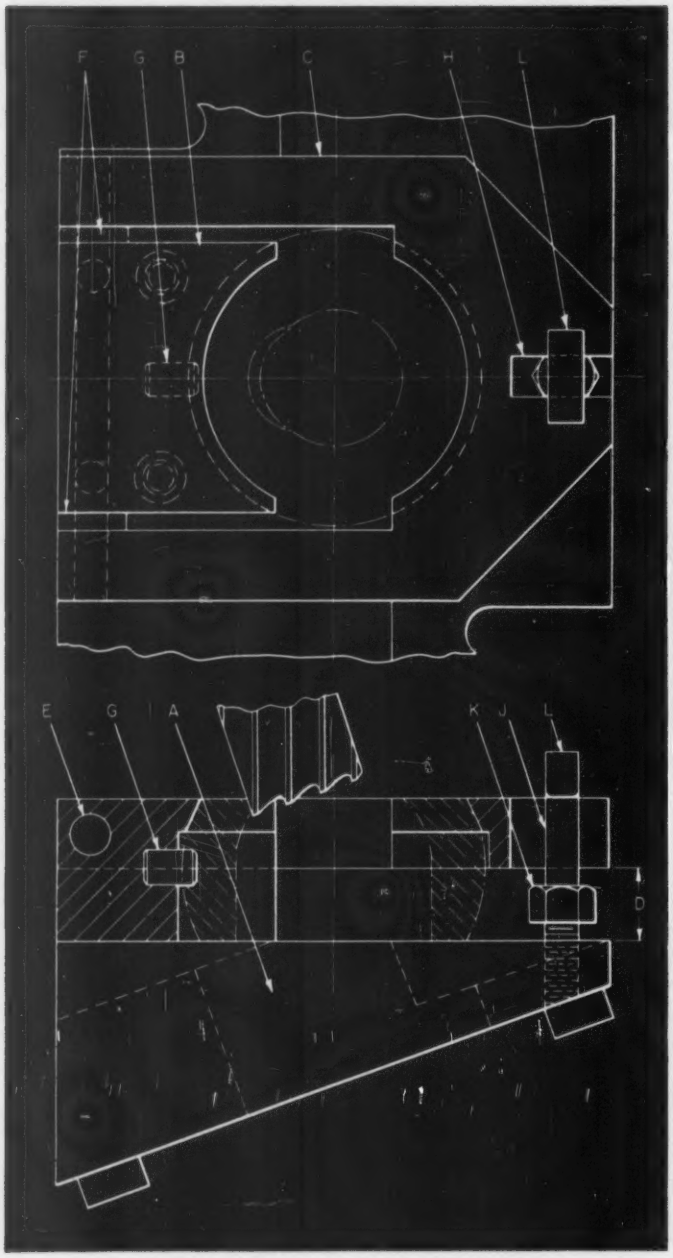
By R. MERY, Farmingdale, L. I., N. Y.

To end-mill crescents in the periphery of a ball, the fixture shown in the illustration on page 204 has proved highly satisfactory. The inside of the object is hollow, being cylindrical through its center, and hemispherical at one end.

The crescents are cut at opposite points in the hemispherical end of the bore, and since they are at a 19 1/2-degree angle with the cylindrical section, the base *A* of the fixture is made at an angle of 70 1/2 degrees with the cylindrical section.

The cover is in two pieces—a stationary plate *B* and a door *C*. For accuracy, the pieces were formed from a solid steel block, being first bored to a 24-degree taper to locate the ball, counterbored for clearance, milled out at *D*, and reamed at *E*. Later the plate and door were separated by the slots milled at *F*. A locating pin *G*, to engage indexing holes in the sphere 180 degrees apart, was pressed into the plate which was then doweled and fastened to the base. After a rectangular slot *H* was milled through the door to receive a clamping screw *J* threaded to the base, the door and plate were hinged together by inserting a pin at *E*.

In order to load the fixture, the door is raised and a ball is positioned against the plate with one of its drilled holes fitting the locating pin. The door is then closed and locked by giving the clamping screw a quarter turn with a wrench engaging the hexagonal section *K*, thereby bringing a cross-member *L* on the upper end of the screw to bear against the top of the door.



For accuracy, the two parts of the cover of this fixture are machined from a solid block.

* * *

Small Business Production Pools for Defense

A new booklet, entitled "Small Business Production Pools for Defense," explains how small firms may voluntarily organize into production pools to improve their chances of obtaining Government defense contracts. Issued by the Small Defense Plants Administration, the booklet gives details about the laws regulating pool operations, procedures for obtaining Government approval of pools, and services which the SDPA extends to a pool during its formation and after it is in operation.

By pooling their facilities, finances, and skills, an increasing number of small firms have been able to procure and execute contracts which none of them could handle alone. The booklet may be obtained free on request to the Small Defense Plants Administration, Washington 25, D. C., or to any of the field offices.

* * *

One-fifth ounce of fuel oil in a General Motors Diesel locomotive will haul 1 ton of freight a distance of 1 mile. Five gallons of fuel oil will haul the same amount of freight from New York to Los Angeles.

INGENIOUS *Mechanisms*

Mechanisms selected by experienced machine designers as typical examples applicable in the construction of automatic machines and other devices

Automatic Rejecting System

By HAIM MURRO

The final press operation on a small drawn cup consists of crimping the edge. Specifications require that the cup contain a cardboard disc, 0.015 inch thick. The insertion of the disc is performed mechanically and must precede the crimping, because this operation reduces the diameter at the edge of the cup. Occasionally, through faulty performance of the disc-inserting mechanism a cup will pass unfilled, but it is important that such a cup be provided with a disc before being crimped. To reject these cups automatically, a punch press was adapted with a highly sensitive electric device and installed in the production line. In the illustration is a diagram of the circuit that was devised.

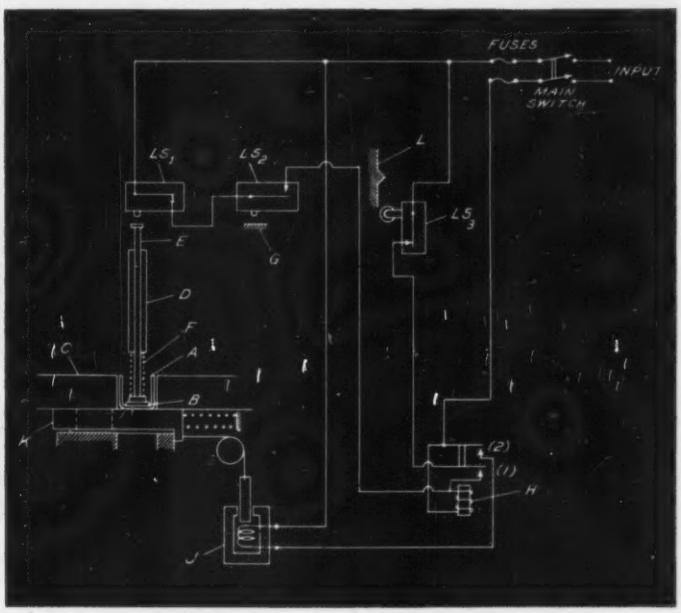
Cups *A* containing discs *B* (shown exaggerated in thickness) are loaded in the channel of a rotary table *C*. This table is designed to index in time to the reciprocation of the ram of the punch press. A sleeve *D* and three limit switches LS_1, LS_2, and LS_3 are fastened to the ram, with which they move as a unit. Micro switch LS_1 is normally closed, micro switch LS_2 is normally open, and LS_3 is a regular limit switch normally closed.

The sleeve *D* encloses a free-sliding rod *E* flanged at both ends, and with a compression spring *F* seated on its lower end. On the down stroke of the ram, the movement of the rod is arrested when it makes contact with the disc—the illustration shows the rod at this point. Further downward movement of the ram until it is 0.015 inch from the end of its travel causes the rod to strike and open limit switch LS_1 if a disc is in the cup. If a disc is missing, the rod will not strike this switch, because there will be a space of 0.015 inch between the rod and the switch. (The switch must, of course, be accurately located on the ram.)

Limit switch LS_2 strikes a stop *G* on each stroke of the ram. The stop is located so as to close the switch immediately after limit switch LS_1 operates. At the end of the down stroke, this arrangement of the two micro switches in series will break the circuit through the switches when a disc is in the cup, and will close the circuit when a disc is missing.

Closing the circuit energizes the magnet of a double-pole relay *H* which is normally open. The closed contact (1) of the relay completes the circuit to a solenoid *J*, and the closed contact (2) of the relay acts to maintain the relay magnet which is energized independently of the positions of the limit switches LS_1 and LS_2.

The solenoid *J* is cabled to a spring-loaded shutter *K* beneath the rotary table, and operates to bring the opening of the shutter in line with the cup. The spring *F*, which is compressed, then forces the rod down so that the empty cup



Punch press adaptation to reject automatically cups not containing discs

falls through the opening to a chute, from which it is returned to the hopper of the disc-inserting mechanism. On the up stroke of the ram, the rod is lifted out of the shutter opening and the solenoid is de-energized when limit switch LS_3 hits a slope L fixed on an upright of the press and momentarily breaks the circuit, allowing the shutter to spring back to its initial position. The solenoid will not again be energized until another unfilled cup is detected.

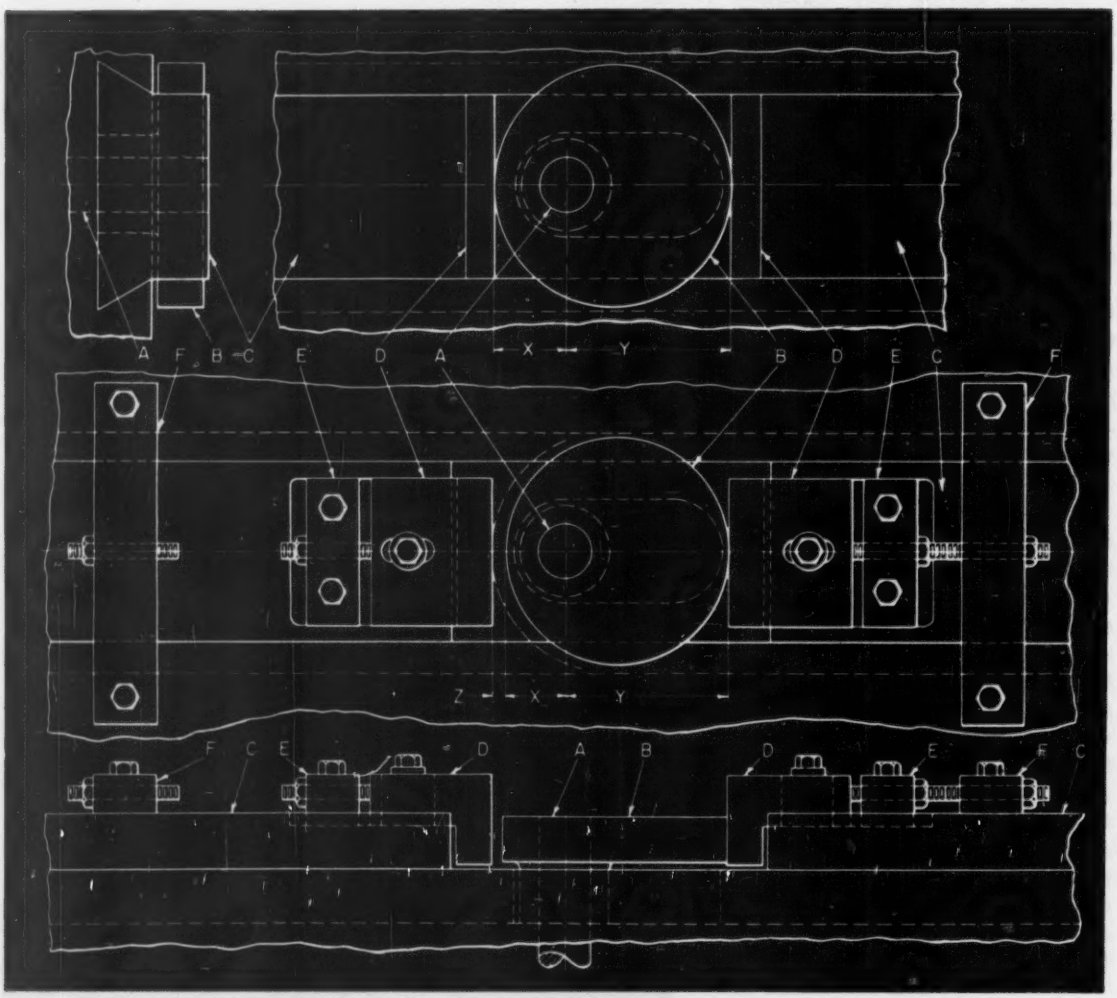
The pressure of the spring on the moving shutter may leave objectionable scratches on the under side of the cup. It is possible to avoid such marks by rearranging the position of the shutter beneath the table to the station to which the work is subsequently indexed. In this manner, the shutter can open before the cup is over it. This arrangement requires two extra relays and a somewhat more complex circuit to provide the device with a "memory."

Modified Eccentric Provides Adjustable Die Stroke

By L. KASPER

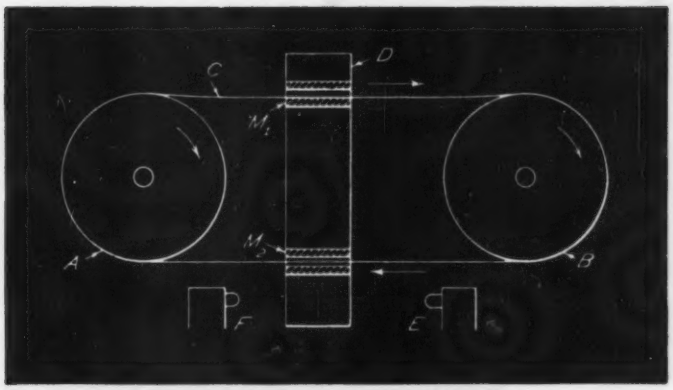
On a machine employed for producing stamped wire products, one of the dies is carried on a reciprocating slide. In the original design of the reciprocating mechanism, shown at the top in the drawing, the slide C on which the die was mounted fitted into a dovetail in the bed of the machine, and was reciprocated by an eccentric B carried on a rotating shaft A. Despite the fact that the contact surfaces of the eccentric and plates D were hardened, wear on the high point of the eccentric soon resulted in lost motion.

Since the only means of correcting the lost motion was to refinish the contact surfaces of the eccentric and the wear plates and then to apply shims behind the plates, it was decided to



In original design of reciprocating mechanism (top), the high point of eccentric (A) wore rapidly. In modified design (center and bottom), contact plates (D) are adjustably mounted on slide (C) to provide take-up for wear.

Wire guide carriage (D) of a coil-winding machine is reciprocated between micro switches (E) and (F) by a steel band (C) which is alternately attracted to two electromagnets (M_1) and (M_2).



redesign the mechanism to provide take-up for wear. This was accomplished by means of the modifications shown in the center and bottom views of the illustration. The redesigned mechanism also provides a means for varying the length of stroke of slide *C*.

In the center view, the outline of the original eccentric is shown in broken lines, while the modified eccentric is shown solid. With this modification it can be seen that dimension *X* has been shortened, producing a space *Z* that results in some lost motion before slide *C* begins moving to the left. As the "throw" of the eccentric is equal to *Y*—*X*, the reduction in dimension *X* increases the throw, and the modified eccentric is therefore capable of moving the slide a greater distance. Since, however, the contact plates *D* are spaced the same distance apart as in the original design, the effective throw of the eccentric is not fully utilized and the travel of slide *C* is exactly the same.

When the high point of the modified eccentric becomes worn, resulting in a reduction in dimension *Y* and the travel of the slide, the slide travel can be increased by reducing the distance between the contact faces of plates *D*. This is easily accomplished since the plates are adjustably mounted on slide *C* in the modified design.

Blocks *E*, carrying screws for accurately adjusting the position of plates *D*, are also mounted on the slide. Bars *F*, secured to the machine bed, carry adjustable screws which limit the slide stroke.

Sensitive Feed Arrangement for Coil-Winding Machine

By PAUL GRODZINSKI

Machines employed for winding fine wires into coils require sensitive feed arrangements that permit extremely quick reversals. For example, in winding wire 0.001 inch in diameter, with the bobbin rotating at 6000 R.P.M., reversing should be accomplished in a distance of 0.001 inch in a hundredth of a second. Although such quick reversals are usually obtained by fine screw feeds or by friction wheels, the arrangement shown in the illustration is a unique solution to the problem.

A steel band *C* is driven at constant speed by means of pulleys *A* and *B*. The band passes through two electromagnets, M_1 and M_2, which are mounted on wire guide carriage *D* of the coil-winding machine. When the carriage comes to the right-hand stop *E*, which is a micro switch, magnet M_1 is de-energized and magnet M_2 energized. The carriage is thus attracted to the lower portion of the band and moved to the left. When the carriage contacts the left-hand stop *F* (another micro switch), magnet M_2 is de-energized and M_1 energized, thus moving the carriage to the right.

Speed of the steel band can be varied to obtain different rates of feed, and the location of the micro switches can be altered to change the length of carriage stroke.

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Motion Picture Tells Ordnance Production Story

A 16-millimeter motion picture on the production of steel cartridge cases has been released by the Clearing Machine Corporation, 6499 W. 65th St., Chicago 38, Ill. This film, with an optical-sound track, was taken in the Rheem Mfg. Co.'s plant near New Orleans, La. It shows the press operations which are necessary to transform a flat steel disc 8 7/8 inches in diameter by 0.690 inch thick into a cartridge case 24 inches long. One of the presses featured is of double-end design with two slides. While one slide is on its return stroke, the other slide performs an operation at the opposite end.

The Sales Engineer and His Problems

By BERNARD LESTER
Management Consulting Engineer
New York

The Sales Manager's Satisfaction with His Job

OUR compensation as sales engineers results from a sense of accomplishment, friendly associations, dollar pay, and the happiness our work brings to home life and leisure. This was pointed out on my page in March MACHINERY.

Job satisfaction to the sales manager comes from somewhat different sources. The best sales manager often is not the best salesman. Succesful sales managers work through other men. They are organizers, friendly leaders, and developers of men.

By pointing out certain weaknesses we have observed in the operations of sales managers, we can illustrate those positive characteristics which make their job so vitally constructive alike to their own companies and to us as sales engineers.

1. Haven't we seen the high-pressure individualistic sales manager who rushes up when the big job gets hot, carries the ball for us as salesmen, and raises his own flag when he returns to his headquarters in commemoration of what *he* has done? The "managing" sales manager ordinarily never closes the deal. He works through the salesmen. The results of team play are his reward.

2. How many of us as sales engineers have seen the sales manager who sits at his desk and calls the shots for the salesman? The sales manager should keep his attention focussed on markets and people, and multiply his efforts through sales engineers. Job satisfaction to him springs from what others do as a result of their initiative, coupled with his leadership and encouragement, often derived from his getting detached from his swivel chair.

3. Some sales managers issue crisp, cold commands without qualifying reasons to support instructions. They may fail to consult with salesmen before establishing different policies or setting new rules that will seriously affect customer relations and valued sales. As conscientious sales engineers, daily in touch with our final boss—the customer—we resent not being taken into the confidence of our immediate superior. We like prompt clear-cut decisions, but we also like to know the "why," so that we can effectively shape our selling procedure.

4. You and I have seen sales managers who are expert after the fact, as critics and advisors are. It is always helpful to analyze why we lost a sale, but it is annoying to have the boss lecture us on what we should have done, without his having made any helpful suggestions beforehand.

5. Many of us whose territory is on the main line of travel have our company superiors drop in frequently. We are likely to be under close observation and pressure. But if we are out in the "sticks," the bosses seldom come near us unless it be a summer call to our northern territory, or a winter call should we be stationed, say, in Florida. We are human. We like the sales manager whose genuine interest brings him to see us and to understand our territory.

6. We like the sales manager who doesn't play favorites—sidling up to those of us who get the nice breaks, and failing to recognize, for instance, that perhaps in our territory we can make the grade only by obtaining a quantity of hard-earned small orders.

7. We like the sales manager who gives us a whole set of keen-edged tools to work with, so that we can present prospects with complete and clean-cut proposals that save routine work, telephone calls, and letter writing. Also we appreciate facts about pertinent accomplishments in other territories that will aid us in ours.

8. We like the sales manager who takes our suggestions seriously, and gives a yes or no answer, supported by sound reasons.

9. Above all, we like a sales manager who is loyal to us when loyalty is deserved. More than that, when we have a just claim, we want him to rear up and fight for us with other headquarters officials and support our plan.

George Washington, during the Constitutional Convention, asked this question—"If, to please the people, we offer what we ourselves disapprove, how can we afterward defend our work?" This principle applies to our selling, and, likewise, to the sales manager's job in selling us.

Happily, many sales managers avoid all the weaknesses here observed. As sales engineers, we know that the sales manager has many responsibilities, but we feel that he can get job satisfaction from considering our suggestions and by making friends of us in a genuinely democratic way.

* * *

Causes of Corrosion

Corrosion is most commonly caused by certain destructive forces present in salty or humid air, as well as by air contaminated with industrial fumes or gases. However, rust also is often caused by other conditions more difficult to detect or to avoid.

As explained in *Technical Aids for Small Business*, publication of the Small Defense Plants Administration, corrosion occurs if certain undue stresses are exerted on work-pieces. When the metal is subjected to repeated cycles of such undue stresses under pressure, the result is a form of corrosion generally referred to as stress corrosion cracking. What happens is that any protective film on the surface of the work-pieces is gradually broken up under the repeated stresses until, finally, rust spreads through the cracks and penetrates the metal. If the rust is not checked, it will eventually cause the work-piece to break down. This condition, known as corrosion fatigue, occurs most frequently in work-pieces made of steel.

Another form of corrosion is called galvanic corrosion, which may occur when two metals of dissimilar nature are brought into close contact. Here, a chemical process takes place which spreads from the contact points to other sections of the work-piece. As a result, the less noble metal is gradually destroyed. This galvanic corrosion is aggravated by rain or sea water, acids, and numerous liquids. Still another form of corrosion—generally called fretting corrosion—occurs on the contact areas of loaded surfaces that are under continued vibration, such as in the races of ball and roller bearings if they are under static loads subject to such vibrations.

New Nickel-Plating Process Uses No Electrolytic Equipment

Refinement of a chemical nickel-plating process requiring no electrolytic equipment—to be known as "Kanigen"—has been announced by the General American Transportation Corporation, Chicago, Ill. General American adopted the process in its search for an interior coating for tank cars carrying corrosive chemicals and materials which had to be free from contamination by "pick-up" iron from the tank-car metal. Previously these cars required periodic enameling of their interiors.

The principle of the process, on which the National Bureau of Standards did considerable work earlier, involves the reduction of nickel by the use of hypophosphites. It is possible to plate almost any solid substance with a dependable and predictable thickness of nickel. For example, intricate valves that were previously difficult to plate can now be covered thoroughly.

Parts subject to hard wear and abrasion can be coated and hardened far beyond the capacity of the parent metal, and overmachined parts can be brought back to proper tolerances. Parts previously fabricated of Monel metal or other corrosion-resistant material can now be of cast steel and plated to a thickness of 3 mils, with assurance that nowhere the plate will vary from that thickness.

The process, it is claimed, will plate any article uniformly regardless of size or shape, and critical areas need not be overplated. It has proved satisfactory for production-line plating of steel, copper, brass, bronze, and aluminum. Tests on plastics and magnesium indicate that these materials will prove practical for "Kanigen" plating. Because porosity of the finish is virtually zero, it is estimated that equivalent plating protection can be obtained with one-third to one-half of the nickel required by other processes.

Physical characteristics of "Kanigen" include a hardness range of 550 to 650 Vickers; very low ductility; a coefficient of expansion 13 by 10^{-6} per degree C.; and an electrical resistance of approximately 60 microhms per centimeter.

* * *

Gearing Industry Reports Increase

According to the latest figures of the American Gear Manufacturers Association, the volume of business in the gearing industry increased by 14.5 per cent in January, 1953, as compared with December, 1952. The AGMA index figure for January was 161.4.

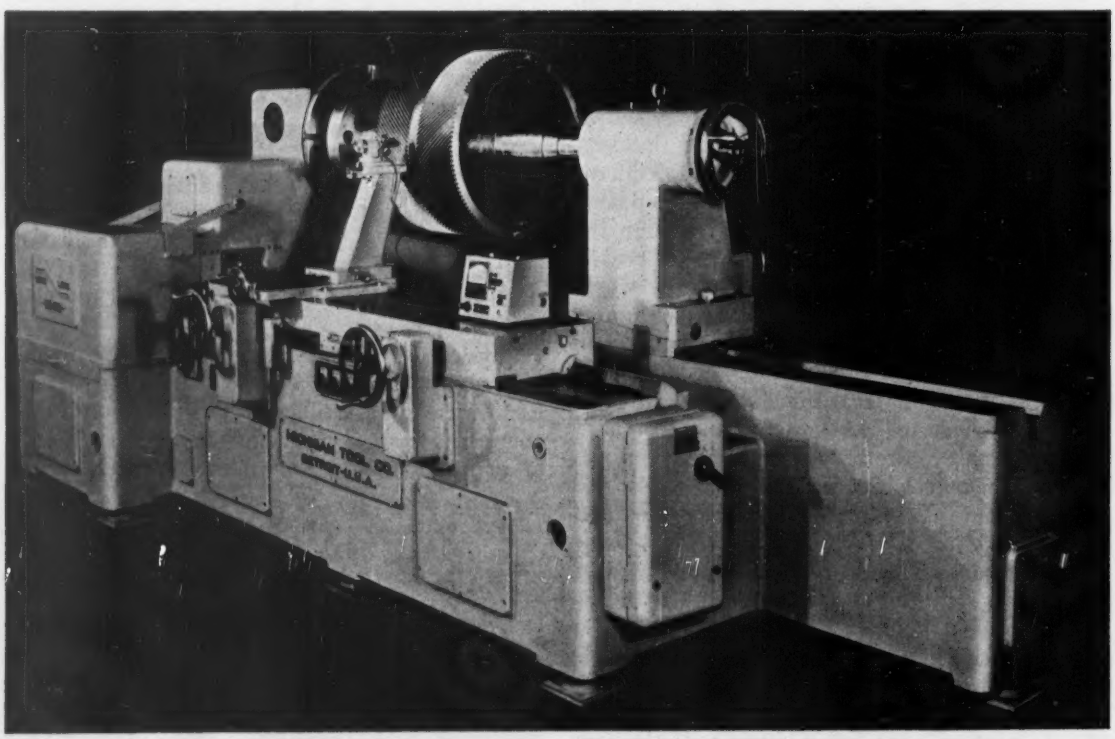
LATEST DEVELOPMENTS IN *Shop*

Michigan "Sine-Line" Lead Checker for Large Helical Gears

A machine designed to check both the lead and axial pitch of large helical or herringbone gears, as well as the parallelism of teeth on large spur gears, has been announced by the Michigan Tool Co., 7171 E. McNichols Road, Detroit 12, Mich. This "Sine-Line" lead checker, known as Model 1248, is said to be the largest in the world. It will check both the lead and axial pitch of gears having outside diameters ranging from 18 to 48 inches, with a maximum face width of 25 inches and maximum shaft length of 96 inches.

Helical gears with either right- or left-hand leads can be checked. The sine bar principle is employed to check leads from 0 to 80 inches. Either manual or power drive can be used for the checking operation. No change in the mounting of the gear is required to check either lead or axial pitch. Gears of varying face widths or diameters, but with the same lead, can be checked without changing the setting of the sine bar.

A transverse table and a longitudinal table are mounted on a massive base which is designed to provide ample strength and rigidity. The transverse table carries the sine bar and the longitudinal table carries the indicator. The sine bar table is arranged to move transversely on the bed at the same time the indicator table moves lengthwise, parallel to the axis of the gear being checked. When moved back and forth, the sine bar table rotates the spindle upon which the gear is mounted. The adjustable sine bar determines the relationship between the movement of the indicator table and the rotation of the gear being checked. Correct adjustment of the sine bar is determined by a simple formula.



"Sine-Line" lead checker for large herringbone and helical gears, brought out by the Michigan Tool Co.

Equipment

Machine tools, unit mechanisms, machine parts, and material-handling appliances recently placed on market

Edited by FREEMAN C. DUSTON, Associate Editor

New Britain Single-Spindle Automatic

A single-spindle automatic designed for maximum versatility in handling bar stock has been announced by the New Britain Machine Co., New Britain, Conn. This model has the spindle speeds required for machining aluminum and the strength necessary for cutting tough alloys. It is essentially a large production type machine yet it takes up little floor space and can also be used on short runs.

Features developed to obtain this versatility include simple camming; wide range of feeds and spindle speeds; large work area; rigid construction; adequate power for machining with carbide tools; chuck designed for hot-rolled stock; ample chip clearance; large coolant capacity; and provisions for applying or making use of the regular standard attachments.

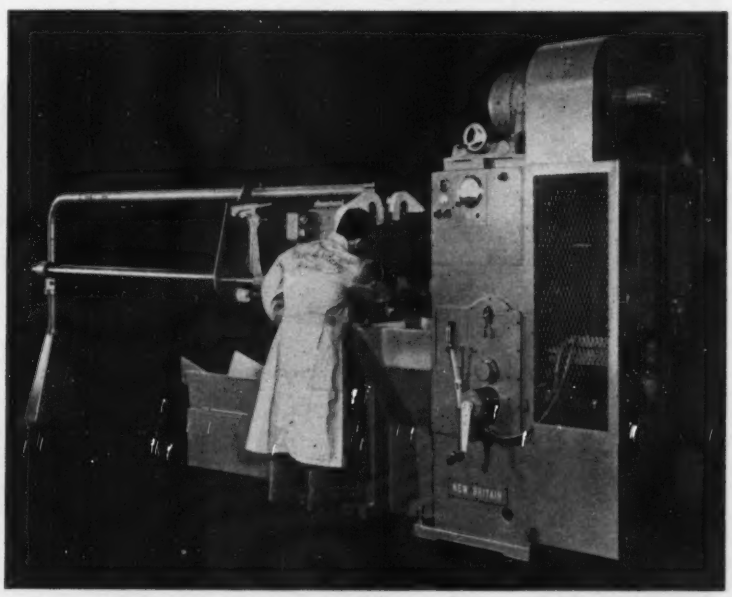
This machine can be changed from one average job to another in 1 3/4 hours. It is equipped with four standard cross-slide cams to cover all desired cross-slide feeds, and with a universal turret cam that provides an infinite variation in feed strokes up to 6 3/4 inches and pre-selection of ten automatically changed turret feeds. Stepless spindle speed changes range from 80 to 1500 R.P.M. These advantages are mostly the result of three special features of the machine—namely, the program drum, automatic transmission with universal turret cam, and standard cross-slide wedge cams actuated by the movement of the turret.

The program drum controls the operations of cutting off, releasing the chuck, and feeding the stock. Pre-set strip cams and five limit switches provide positive timing of these movements in proper sequence. Also mounted on the drum are five shifter arms which, during the high-speed cycle, automatically pre-select any one of ten feeds for each of the five turret stations. This automatic transmission has two ranges of five feeds each, in steps from 0.003 to 0.060 inch. The operator can set the high-speed and low-speed cycles quickly, choose the exact length of feed stroke, and pre-select the feeds required for each of the turret stations without changing feed-gears.

Cross-slide cams are actually sine bars or wedges mounted on the front of the turret. When the turret feeds forward, the wedges are moved ahead under the spherical rollers on the ends of the cross-slide arms. As the rollers ride up the cams, the cross-slides are fed inward.

The cross-slide cams are made in four standard ratios or sizes: 1/10, 2/10, 3/10, and 4/10. With a turret feed of 0.012 inch, the cross-slide will have a feed of 0.0012 inch per revolution with a 1/10 cam, and a feed of 0.0024 inch with a 2/10 cam, etc.

If any other feed is desired, it can be obtained by increasing or decreasing the cam angle with adjusting screws. A cam-setting gage permits the cams for the next job to be pre-set at the bench. Every turret station has a mounting for front and rear cross-slide cams so that independent forming operations can be done in either position.



New Britain versatile single-spindle bar stock automatic with wide range of spindle speeds

Lewis Die Forge Casting Machine

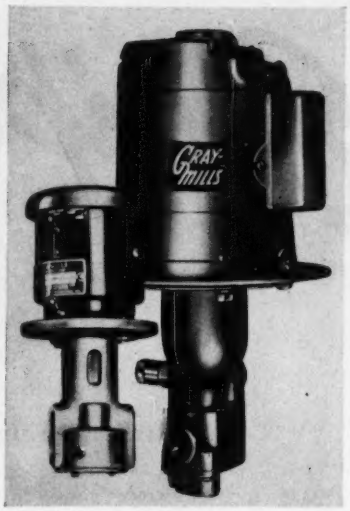
The development of a die forge casting machine, which is said to make possible remarkable economies in the production of die-castings, was announced recently by the Lewis Welding & Engineering Corporation, Bedford, Ohio. This machine employs the so-called "cold-chamber" method of injecting the metal into the die, but introduces a new principle which provides for rapid filling of the die cavity while the metal is molten and the application of an unusually high final squeezing pressure. This final squeezing action serves to prevent shrinkage voids as the metal solidifies and to eliminate excessive porosity due to trapped air and gases.

In addition to the new principle of injection, the machine has a new method of clamping the dies together, known as "Hydra-Lock," which develops a final clamping pressure of 650 tons. The clamping mechanism embodies three principal elements: A small hydraulic cylinder advances the platen on which the moving half of the die is mounted to a position where the die faces are open only a fraction of an inch; a mechanical locking device holds the platen in the closed position; and a 28-inch diameter hydraulic cylinder, actuated automatically through the control circuits, performs the final closing of the dies and supplies the final locking pressure. The stroke of this large cylinder is so short that only a fraction of a gallon of oil and a few tenths of a second are required for this part of the clamping cycle.

The machine develops an injection pressure of 100,000 pounds by means of a special hydraulic two-stage injection system. Two pistons are employed, one being concentric with the other. The small-diameter piston travels at variable speeds up to 810 feet per minute to fill the die cavity with molten metal. When the die is filled, resistance is encountered and the larger piston is activated. A total pressure of 100,000 pounds is developed with a pressure of 2100 pounds per square inch in the hydraulic system. This pressure is the maximum available but can be readily adjusted downward to suit varying casting requirements.

Flexibility in the die-casting operations is thus made possible by the variable injection speeds and pressures available. These can be adjusted to conform to the actual requirements of the die cavity and the natural flow of molten metal.

The hydraulic unit is furnished as separate equipment in order to make installation as convenient as possible for the user and to reduce the over-all length of the machine to a minimum. This unit may be set anywhere with reference to the machine itself, providing only that the length of piping is not excessive. The die forge casting machine weighs 29,000 pounds.

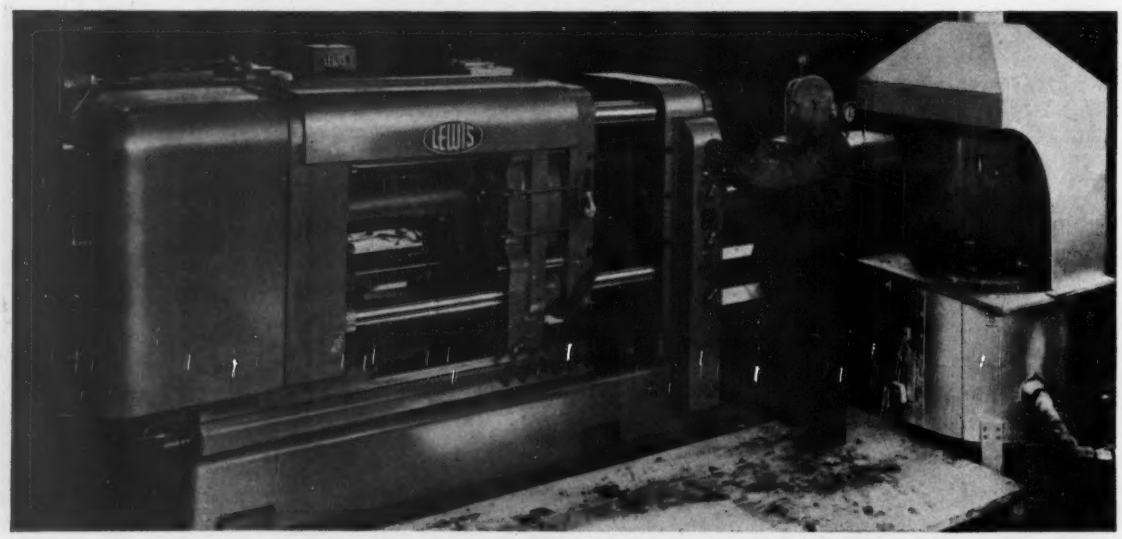


Gear pump of new line introduced by the Graymills Corporation

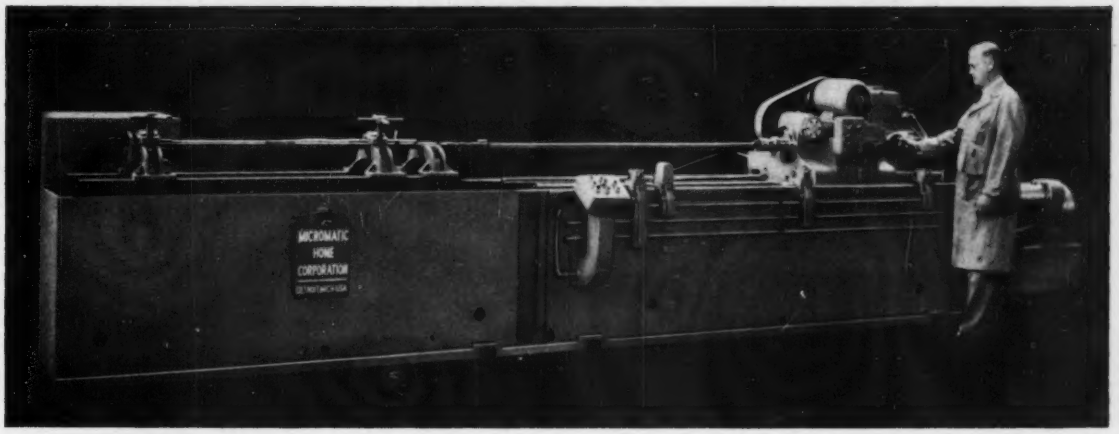
Small Gear Pumps

A new line of gear pumps has been introduced by Graymills Corporation, 1948 Ridge Ave., Evanston, Ill., in three basic sizes for fluid delivery at 1, 2, and 3 gallons per minute. Motor sizes are 1/25, 1/8, 1/4, and 1/2 H.P., with pressures to 100 pounds per square inch.

These pumps are designed for handling coolants, oils, solvents, and emulsions, and for various circulating and small spraying systems, etc. The pump units are self-priming and directly connected to face-mounted motors.



Die forge casting machine announced by the Lewis Welding & Engineering Corporation



Micromatic honing machine equipped with automatic feeding and sizing devices for finishing gun barrels

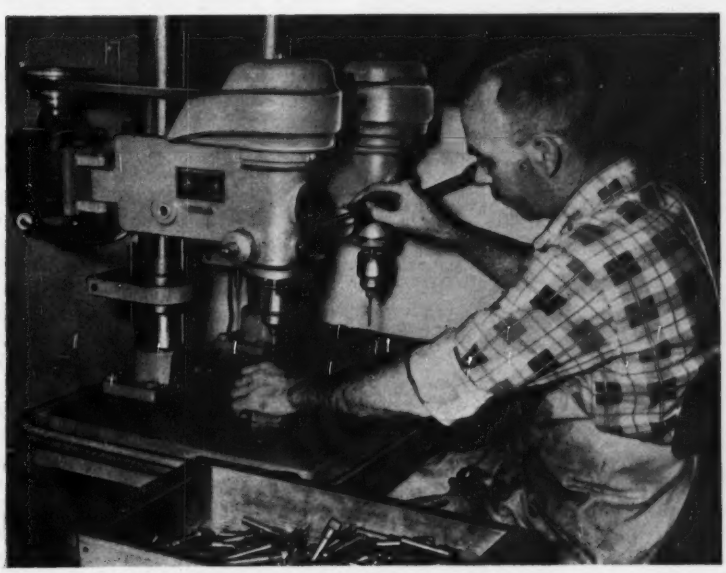
"Hydrohoner" with Automatic Equipment for Finishing Gun Barrels

The Micromatic Hone Corporation, 8100 Schoolcraft, Detroit 4, Mich., has built a "Hydrohoner" equipped with automatic feeding and sizing devices for finishing gun barrels. A Model 606 or 612 horizontal machine can be provided with patented "Microdial" automatic feeding and "Microsize" automatic sizing devices for honing gun barrels up to 4 inches in diameter. These machines will hone gun barrels to exceptionally close tolerances in one completely automatic cycle.

The Model 606 horizontal "Hydrohoner," shown in the illustration, is said to be the first machine of this kind to be equipped with these automatic controls. This particular machine is used to hone 20-millimeter and 60-caliber gun barrels. This type of honing machine can be constructed to handle gun barrels, tubing, and shafts of any length.

Production Type Drill Press

A production type drill press has been brought out by the South Bend Lathe Works, 425 E. Madison St., South Bend 22, Ind. This machine is designed for multiple operations involving drilling, tapping, reaming, burring, and chamfering. It is said to be highly efficient on long production runs and, because of its versatility, can also be used to advantage for the shorter runs of job shop work. Four types, with from one to four drill heads, are available.



South Bend production model drill press

Each drill head is essentially a South Bend 14-inch precision type drill press. A simple belt tension release provides for quick speed changing. The free-floating spindle eliminates side thrust and whip. Sealed ball bearings simplify maintenance, and a built-in work light in each drill head gives good illumination and prevents shadows around the work area. Either a 1/3- or 1/2-H.P. motor may be installed. Approximate spindle speeds range from 720 to 4325 R.P.M. The maximum distance from spindle to column is 7 inches and from chuck to table, 18 inches.

A positioning attachment gives each drill-head assembly 4 inches of vertical adjustment at any one setting. This attachment can be set at any point on the column. After being locked in position, it can be swiveled around the column with the drill head and used to move the head up and down by means of worm gearing.

The sturdy work-table is accurately machined so that jigs and fixtures line up square with the spindles. Large coolant grooves slope to the rear, where a built-in chip trap prevents chips from clogging the coolant drain. The work-table for the single-spindle model is 14 by 15 inches and for the four-spindle model, 14 by 55 inches. These tables can be placed on a bench or on heavy cast legs.

Pratt & Whitney "Electrolimit" Jig Borer for Tool-Room

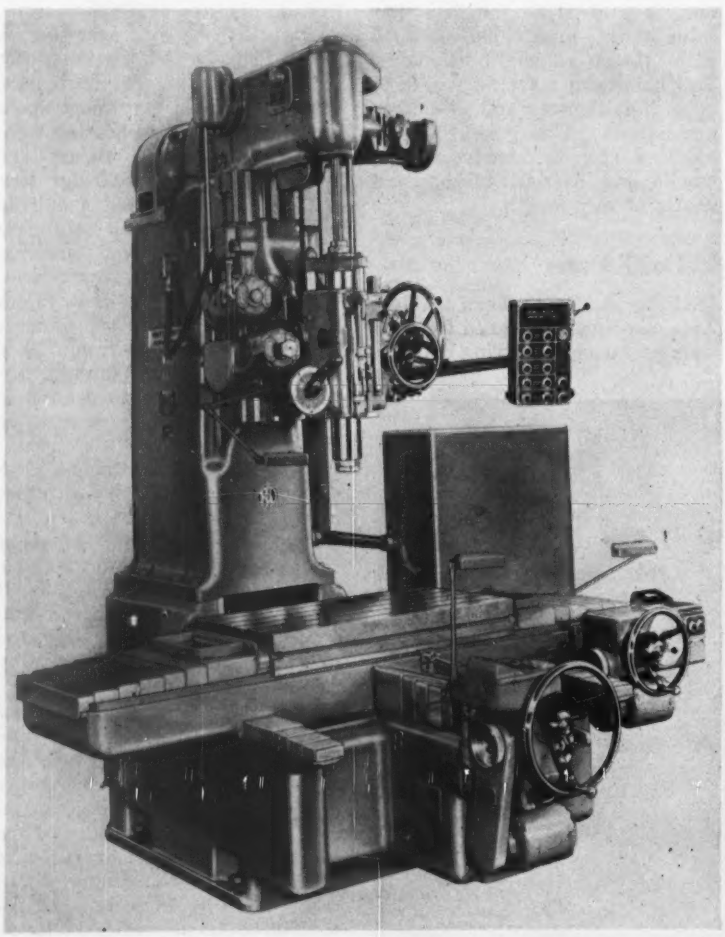
A jig borer designed primarily for tool-room use has been added to the "Electrolimit" series manufactured by Pratt & Whitney Division Niles-Bement-Pond Co., West Hartford 1, Conn. This No. 2E size machine is equipped with "Electrolimit" measuring systems and a preloaded ball roll-mounted quill. It is capable of precision locating, boring, and milling tool-room work within close limits of accuracy.

The machine has two separate measuring units, one for longitudinal and the other for transverse movements. Each unit provides basic 1-inch spacings electromagnetically through the use of a solid notched master bar, and registers a zero reading on an indicating meter without making physical contact. Fractional inch movements are obtained by moving a small electromagnetic head by means of a micrometer head graduated for reading to 0.0001 inch. Since a 1/32-inch movement of the 4 1/2-inch-diameter micrometer thimble represents a setting change of 0.0001 inch, smaller estimated settings are possible.

The quill "roll-feeds" on 288 precision balls preloaded between the hardened quill and liner with a total bearing pressure of 6000 pounds. The bore in the head is provided with a hardened and ground steel liner assembled by the deep-freeze method and precision-lapped in place. The quill is hardened, precision-ground, and draw-lapped for extreme accuracy and to "lay the surface pattern" in the direction of motion to insure the maintenance of permanent accuracy. The stability of the ball roll-mounted quill is said to make milling feeds practical for the table and carriage, adding to the machine's versatility. Vertical movement of the head assembly is controlled by push-buttons. An automatic interlocking mechanism clamps the head positively in position on the column when motion ceases, and releases it before motion starts.

The jig borer has electronically controlled milling feeds that are infinitely variable from 1 to 15 inches per minute. Rapid power travel of 60 inches per minute is also provided. There are eight selective spindle feeds ranging from 0.0005 to 0.015 inch per revolution, both up and down. Twelve spindle speeds ranging from 37 to 1800 R.P.M. are provided through a gear-box and four-speed motor. The table has a working surface 22 by 44 inches; travel is 36 inches longitudinally and 22 inches transversely. Maximum height between the table and the spindle end is 27 inches.

Other features included in the jig borer are a centralized control zone with a push-button control box that is adjustable for height; open-side design for handling large work-pieces; precision hand-scraped bearing surfaces; automatic pressure lubrication; and telescoping chip guards on all bed and carriage ways.

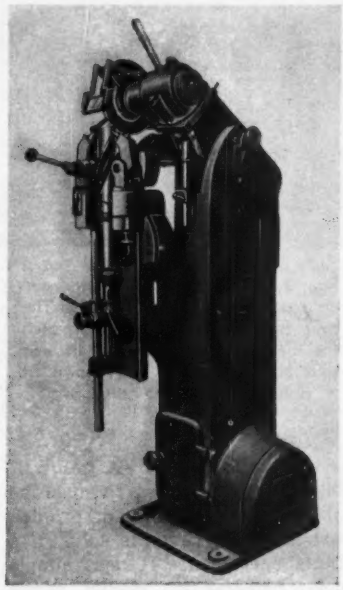


Pratt & Whitney jig borer designed primarily for tool-room use

"Molub-Alloy" Metallic Lubricant

"Molub-Alloy," a lubricant applying a new concept in lubrication which uses petroleum as a vehicle instead of as the primary lubricating agent, is being manufactured by the Imperial Oil & Grease Co., Inc., 6399 Wilshire Blvd., Los Angeles 48, Calif. It is produced in a wide range of types and weights from hydrocarbon base stock, or from synthetic or volatile base materials to which have been added scientifically homogenized micron-sized particles of self-lubricating metallic solids. These metallic solids act as millions of micron-sized ball bearings.

One of the solids—molybdenum disulphide—is a metallic lubricant resistant to water, high heat and pressures, with unusual adhesiveness to metal. It is made as a grease in standard weights, and in oils for heavy gear to high-speed spindle applications.



Machine for twist drill pointing and web thinning operations

May Twist Drill Pointing Machine

Twist drill pointing and web thinning operations can be combined in a single May Model A4 machine now being distributed in this country by the Kurt Orban Co., Inc., 205 E. 42nd St., New York 17, N. Y. The two front angles of a twist drill point are ground symmetrically and the thickness of the web between the flutes is reduced at the same time by the oscillating grinding wheel of this machine. Drills from 0.393 inch to 2.95 inches in diameter can be clamped between the spring-loaded jaws. The grinding wheel is moved manually to the drill point. Clamping and sharpening motions are mechanically controlled, enabling unskilled operators to obtain accurate work.

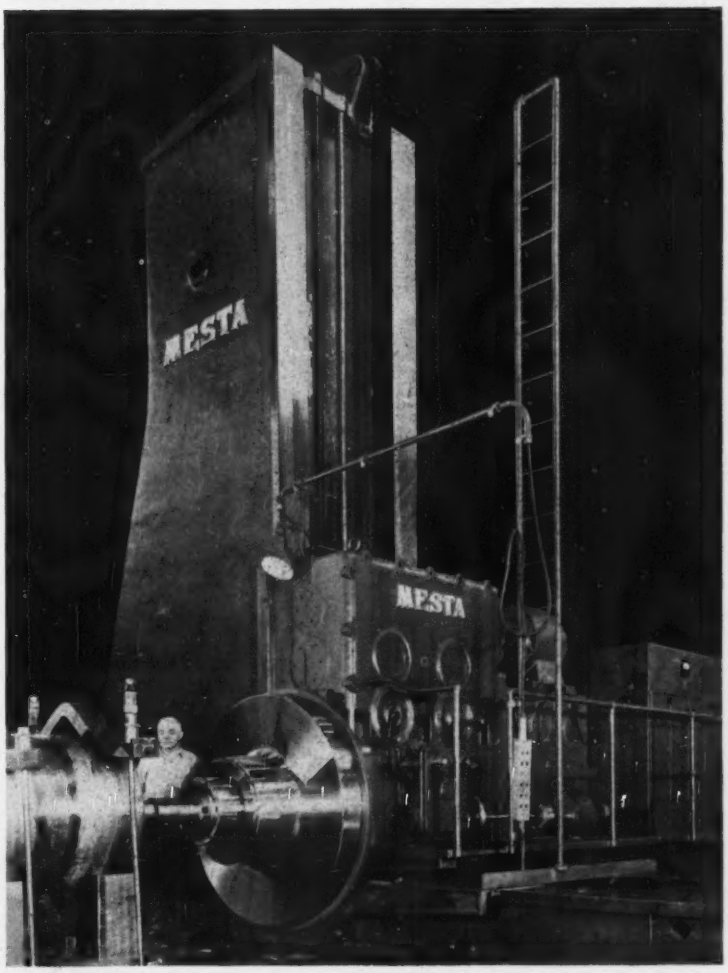
The machine is adapted for three types of grinding: first, for a simple reduction in web thickness, in which one side of the point is ground to the depth fixed by the setting of a stop, after which the drill is turned 180 degrees and the point ground on the other side; second, for grinding drill to obtain improved chip flow—in this case, when the lowest point on the grinding wheel is reached, the drill is moved sideways at the same time that it is turned round its center, these movements being controlled by a handwheel; and third, for sharpening drills which are to be used in drilling very hard steel. In the latter case, the grinding is carried up to the center of the drill to provide a top rake which will make it easier for the drill to penetrate the metal.

The machine is 56 inches high and has a base 15 by 14 inches. It requires an operating floor area of 40 by 24 inches. The grinding spindle is driven by a 1/4-H.P. motor, by means of a belt running over tension rollers.

Mesta Giant Size Horizontal Boring and Milling Machine

A huge horizontal boring and milling machine capable of performing exceptionally heavy drilling, tapping, boring, and milling operations has been designed and built by the Mesta Machine Co., Pittsburgh, Pa. This multi-purpose machine will drill and bore holes from 3 inches to over 10 feet in diameter. The spindle is 18 inches in diameter, has a variable speed of 3/4 to 56 R.P.M. and maximum stroke of 8 feet.

The tremendous capacity of this machine will be utilized by the Mesta Machine Co. for precision finishing operations on mammoth forgings which this company will assemble into one of the world's largest hydraulic presses to be used in the United States for aircraft production. Construction of this press involves the accurate machining and assembling of huge castings weighing nearly a million pounds and forgings hammered out of ingots weighing over 500,000 pounds. The completed



Mesta giant size boring and milling machine for finishing castings and forgings

press will have a capacity of 50,000 tons and will be capable of squeezing slabs of aluminum and magnesium alloys into airplane sections.

The boring and milling machine illustrated is of heavy cast construction throughout. It consists primarily of a main base with a moving column and saddle. Iron castings used in constructing this machine are made of close-grained air furnace iron, and the steel castings are made of high-quality acid open hearth steel. The column was cast in one piece and mounted on ways of the heavy cast-iron base. It is provided with horizontal rapid traverse and feed through the use of a special bronze nut and a forged steel screw which extends along the bed for a distance of 30 feet. The weight of the column and saddle on the ways is relieved by springs.

The cast-iron saddle, mounted on the side of the column, has a vertical travel of 13 feet. Vertical traverse and feed are obtained through a vertical screw. Complete gearing is enclosed in the saddle case for all traverse, feed, and tool movements. Sliding gears are controlled by hand-levers, conveniently located for the operator on the outer case. The machine has an over-all height of 24 feet 3 1/2 inches.

Punch Shaper for Rapid Machining of Blanking Punches in One Set-Up

Economy, versatility, and accuracy are qualities claimed for a punch shaper now being introduced in the United States by the International Machinery Division, British Industries Corporation, 164 Duane St., New York City. This punch shaper, manufactured by the E. H. Jones CVA group of England, is designed to machine a blanking punch, hob, or profiled part directly from the solid in a single operation. It uses simple tools, requires no special punch holders or plates, and can be operated by one man.

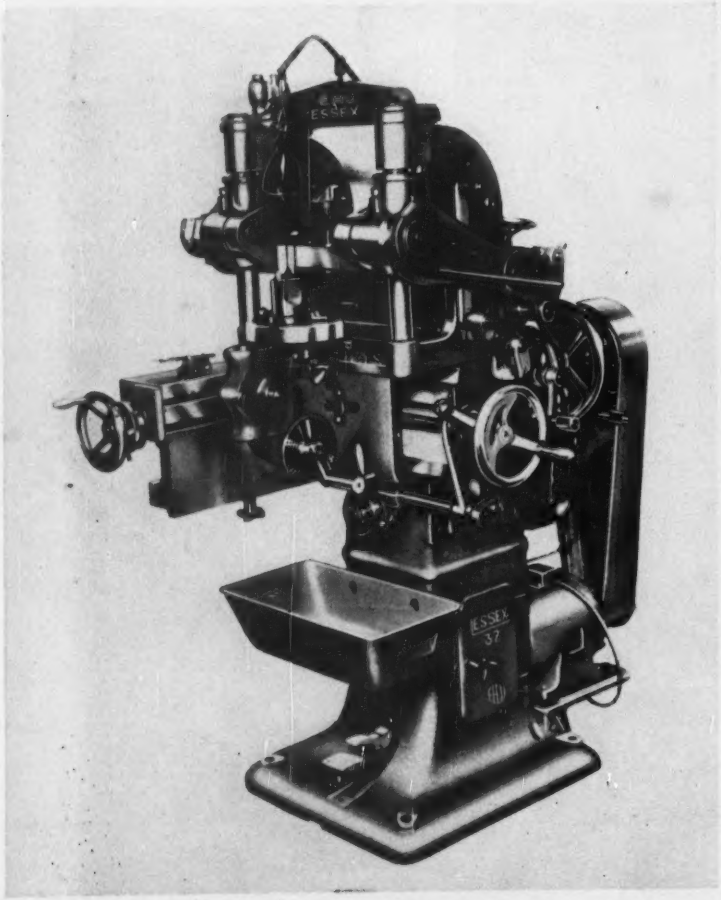


Fig. 1. Essex punch shaper introduced by International Machinery Division, British Industries Corporation

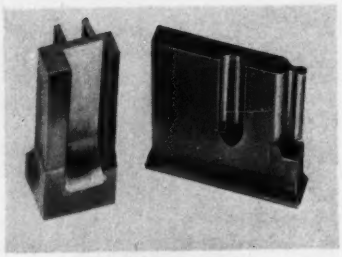


Fig. 2. Typical punches produced on machine shown in Fig. 1. The time from lay-out to finished punch for the example shown at left was four hours, and for one shown at right, five and one-half hours

It is said that in the majority of cases, punches can be completely finished on the punch shaper in much less time than is required by conventional methods. This machine can be easily set up and a high degree of accuracy and fine micro-finish obtained. The cutting tool used is of the kind ordinarily employed in shapers. The stroke of the tool is like that of a conventional shaper except that the reciprocating motion is in a vertical plane, and upon completion of the predetermined straight stroke the rocker arm operates with a swivel motion to finish the desired radius at the base of the punch. The stroke is adjustable from 1 1/2 to 4 1/2 inches.

The profile or shape of the punch can be laid out, or a template can be soldered to or mounted on the solid block of tool steel from which the punch is to be machined. The microscope attachment is then set directly above the work to enable the operator to accurately machine the punch to the lay-out lines. If desired, the punch can be made a few thousandths inch over size, and then sheared into the die to a depth of about 1/32 inch. The rest of the punch can then be finished to the exact contour of the "sheared in" section, to an accuracy of plus or minus 0.0005 inch, by using the microscope.

One of the features of this machine is a special table shaping

attachment which permits swiveling the dividing head from 0 to 15 degrees toward the tool and 5 degrees to right and left. This attachment enables the operator to machine punches with the required relief or hobs with the desired draft.

Westinghouse Heat-Treating Furnace

Temperatures up to 3100 degrees F. can be obtained in a metallurgical heat-treating furnace available from the Westinghouse Electric Corporation, Box 2099, Pittsburgh 30, Pa. A water-jacketed chamber, an integral part of the furnace, permits work to be cooled as well as heated in a protective atmosphere. The furnace is designed for use of either hydrogen or dissociated ammonia.

Four manually operated, counterbalanced doors on the furnace separate its charging, heating, and cooling chambers. The furnace is intended for batch type heating, the work being handled on trays and manipulated by push and pull rods. The cooling chamber is constructed of welded steel plates to incorporate a water-jacketed housing. Ample cooling surface is provided to assure cooling of the charge below the oxidation point before it is discharged.

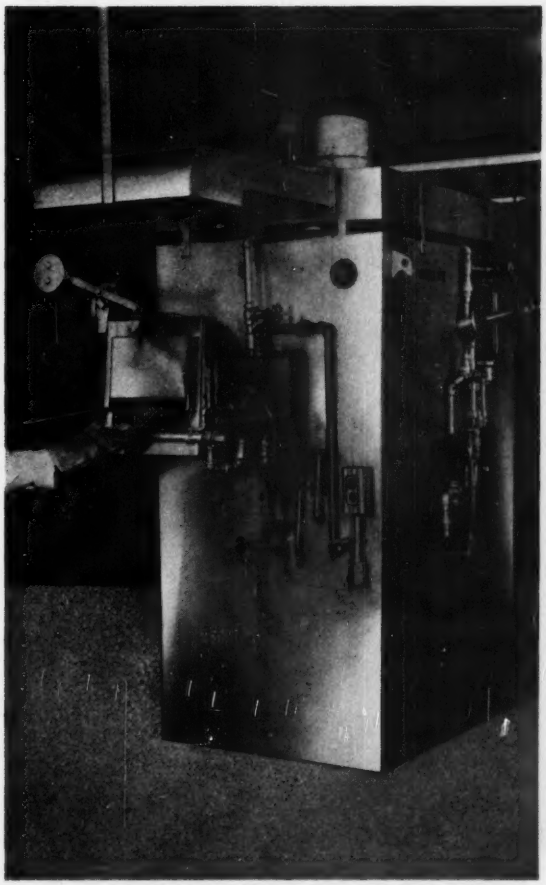
The heating elements are made of heavy molybdenum-alloy rod formed into sinuous loops and supported on Alundum refractories. The furnace hearth is made of molybdenum alloy to prevent warpage and provide a smooth, hard surface over which the trays are easily moved. Protective atmosphere consumption for this high-temperature furnace is between 150 and 200 cubic feet per hour.

Heavy-Duty Drilling Machine

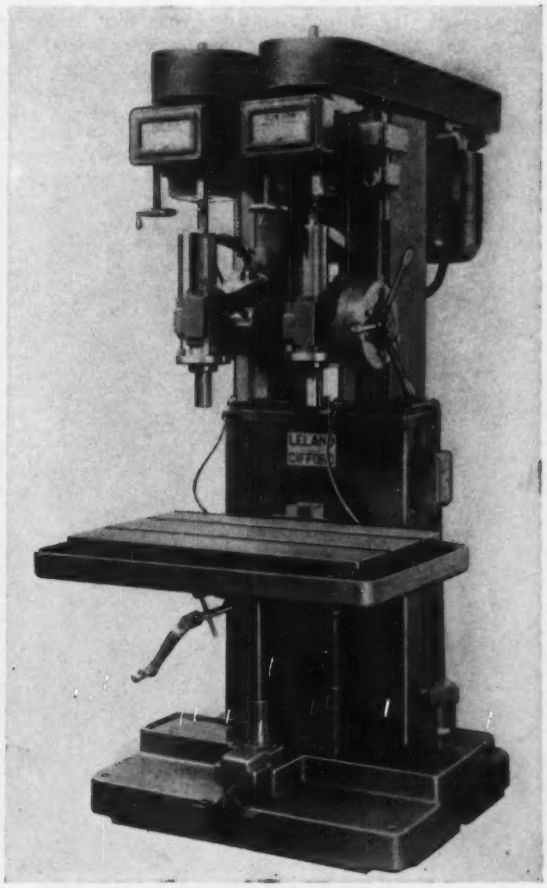
A No. 3MVB heavy-duty drilling machine that will drill holes up to 1 1/4 inches in diameter in steel or 1 1/2 inches in cast iron is being manufactured by the Leland-Gifford Co., Worcester 1, Mass. This machine has a 24-inch swing and from one to four spindles with No. 3 or 4 Morse taper. Power, hand, or hydraulic feeds are available. The power feed has three feed rates, adjustable depth stop, and safety slip clutch. The hydraulic feed has either plain or step-by-step controls.

A four-speed motor with back-gears provides eight standard speeds. Single-speed motors with or without back-gears or four-speed motors without back-gears can also be furnished for other speed ranges.

On multi-speed machines, all speed changes (including back-gear shifting) are made instantly without stopping the machine or



New Westinghouse heat-treating furnace



Leland-Gifford heavy-duty drilling machine

requiring the operator to move from his regular position. The approximate weight of the four-spindle machine with four-speed motor is 9800 pounds. It requires a floor space 76 by 61 3/4 inches and has an over-all height of 92 3/4 inches.

Burr-Master for High-Speed Chamfering and Deburring Flywheel Ring Gears

The Modern Industrial Engineering Co., 14230 Birwood Ave., Detroit 4, Mich., has announced a Burr-Master Model BM-2029 machine designed to deburr and chamfer all the teeth of a 156-tooth flywheel ring gear 14 inches in diameter in only eight seconds' cutting time. The gear is loaded into the machine by slipping it over three rolls on the fixture and into mesh with a drive gear. A locating finger, moving with the cutting tools, automatically locates the gear teeth radially on each stroke of the form type cutting tools, thus compensating for any out-of-round condition or flatness variation.

With the drive gear indexing continuously, chamfering begins as soon as the gear to be cut is meshed with it. A combination rocker arm motion actuates the form tools to provide a generating cutting action, which enables the tools to chamfer and deburr all tooth edges well around the root of the gear tooth, leaving a burr-less chamfered surface. Depth of cut is readily adjustable.

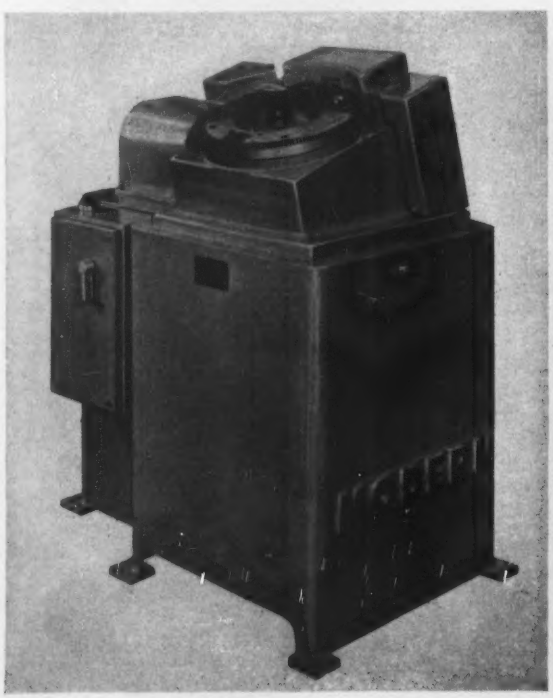
Automatic indexing takes place during the return stroke of the tools. With the tools reciprocating at five strokes per second and chamfering four teeth with each stroke, the cutting rate is twenty teeth per second. When the cutting cycle is complete, a cycle indicator light signals that the gear is ready for removal. The operator depresses a lever to eject the gear by lifting it up and out of mesh with the drive gear.

The machine requires a floor space 26 by 34 inches, has a working height of 42 inches, and weighs about 2300 pounds. Power is provided by a 1/2-H.P. 1800-R.P.M. motor.

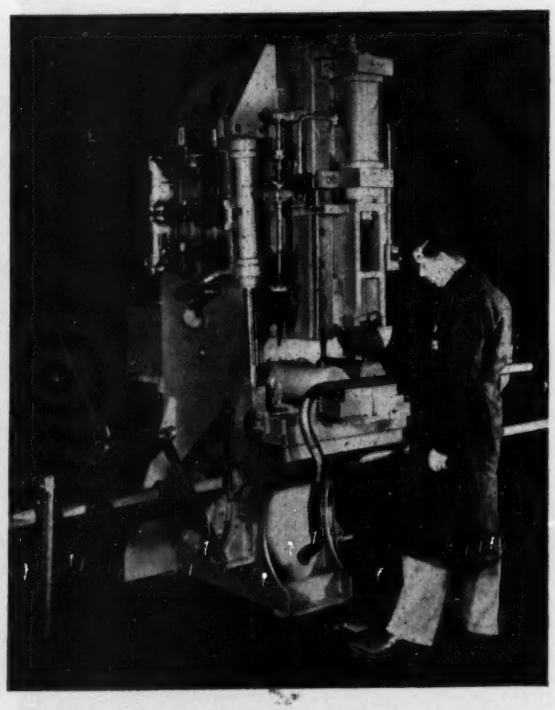
Pines Hydraulic Pipe and Tube Bending Press

A vertical ram type pipe and tube bending press, designed with unusual working clearance to speed the handling of a variety of multiple bends in different planes, is announced by Pines Engineering Co., Inc., 601 Walnut St., Aurora, Ill. The press is a fully hydraulic, self-contained unit with a rated capacity of 20 tons. Design features include twin equalizing cushion cylinders offset on the press frame, automatic angle-of-bend cycling with automatic return to starting position, variable speeds, single-screw adjustment for wing dies, and shortened die-holders for maximum clearance.

This machine has adequate power and capacity for repeat bending of steel tubing in outside diameter sizes from 1/2 inch to 2 inches with a maximum wall thickness of 0.083 inch without excessive flattening, wrinkling, or distortion. Clearance is provided to bend a 2-inch tube with a 5-inch center-line radius to 180 degrees. One of the primary applications of the press is bending automotive exhaust and tail pipes. A 100-gallon oil reservoir is built into the machine base, and the 20-H.P.,



Burr-Master chamfering and deburring machine made by Modern Industrial Engineering Co.



Hydraulic pipe and tube bending press brought out by the Pines Engineering Co., Inc.

1200-R.P.M. motor is vertically mounted at the rear of the machine. The press operates on 220-440 volt, three-phase, 60-cycle current. Control circuits operate on 110-volt, 60-cycle current, with step-down from line voltage through a transformer.

High-Production Precision Threading Unit

A Murchey "Precision - Pak" threading unit designed for high-production threading has been placed on the market by the Sheffield Corporation, Dayton 1, Ohio. Features of this self-contained, fully automatic power unit include direct precision lead, rapid return of tool spindle, and variable speeds. Flexibility of application and low cost of maintenance are also advantages claimed for this compact unit.

The hardened and ground spindle is driven by a 3-H.P. motor. Precision lead is maintained throughout the entire feed travel of 4 inches by a hardened and ground quick-change lead-screw and collapsible lead-nut head which are mounted at the rear end of the spindle. At the end of the feed travel, the lead nut is automatically disengaged and rapid spindle return is obtained through a planetary gear type clutch.

The unit is adaptable for mounting in a horizontal, vertical, or angular position, and can be used in single, double-end, or multiple arrangements. It can also be used in conjunction with Murchey collapsible taps and self-opening dieheads for high-production precision threading applications such as shell tapping, rocket threading, and the threading of a great variety of aircraft and automotive parts.

High-Speed Tool Bits and Cut-Off Blades

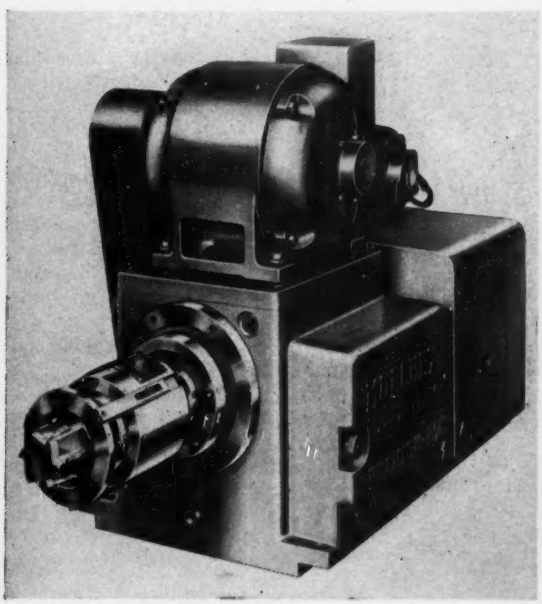
The Plew Tool Co., Inc., S. Line St., Columbia City, Ind., has added to its "Lucky 13" cutting tools another line made of two new high-speed steels, "Lucky 7" and "Tuf-Cut." These steels were created through a special process of high and low heat-treatments. From these steels are made square and flat tool bits, cut-off blades, hollow mills, and form-facing cutters with either spiral or radial relief. The steels are also manufactured in finish-ground flats, squares, dovetails, and circular tools ground to customers' specifications. "Lucky 7" is a vanadium type steel and "Tuf-Cut" a molybdenum type, both with a very high tensile strength and a Rockwell hardness of C 64 to C 66.

Square tool bits are carried in stock in sizes from 3/16 inch square by 2 inches long to 1 1/4 inches square by 7 inches long. Flats are carried in sizes from 1/4 by 1/2 by 4 inches to 1 by 1 1/2 by 7 inches. Tools from "Tuf-Cut" are available either ground or unground. Straight cut-off blades are carried in stock from 1/16 by 1/2 by 4 inches to 5/16 by 1 by 6 1/2 inches.

Bath Press Type Brake

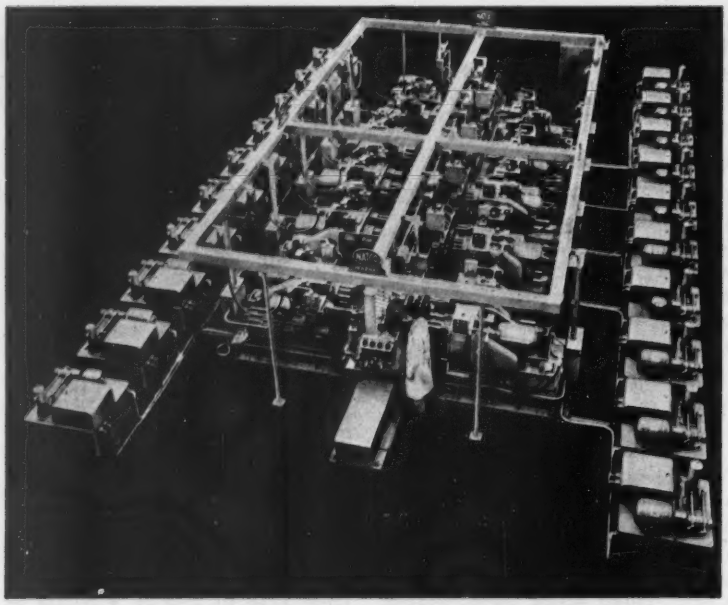
A press type brake combining the main functions of the press brake and the stamping press in an exceptionally versatile machine of high production capacity has been brought out by the Cyril Bath Co., Machinery Ave., Cleveland 3, Ohio. Blanking, piercing, shallow drawing, bending, trimming, and similar operations can be performed at a standard speed of forty-five strokes per minute, or as high as sixty strokes per minute in the case of light work. Closed side housings, over-size slide areas, end feeding, and a new direct-acting clutch-brake combination that needs no adjustment for wear are outstanding features.

The ram and bed of this press are mounted flush with the face of the housing, eliminating any



Murchey self-contained automatic threading unit

Press type brake introduced by the Cyril Bath Co.



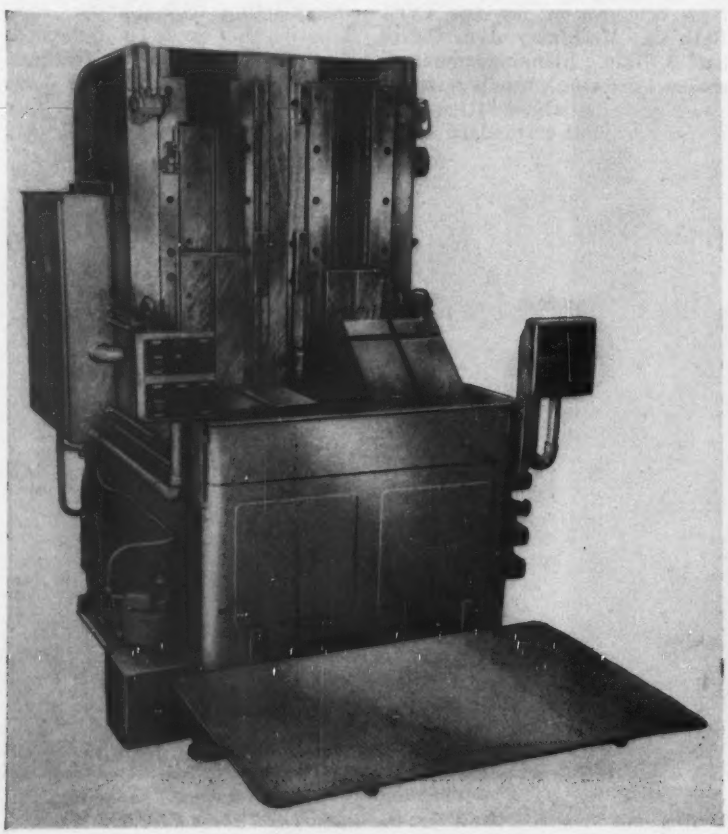
"Holeway" transfer machine developed for rapid, continuous processing of engine blocks

danger to the operator from reaching in under the ram. The press has a standard stroke of 5 inches and a shut height of 14 inches with a ram adjustment of 5 inches. Operation in series and end feeding serve to speed up production by eliminating work transfer from one machine to another and the tie-up of slower, larger draw presses. The capacity rating is 150 tons each in five sizes—4-, 6-, 8-, 10-, and 12-foot bed lengths.

Natco "Holeway" Transfer Machine

The National Automatic Tool Co., Inc., Richmond, Ind., has incorporated new mobile hydraulic power units in a "Holeway" transfer machine developed for automatic processing of engine blocks. The power units are designed to comply with J.I.C. Standards and to make possible continuous high production. They are shown arranged in rows at the right- and left-hand sides of the transfer machine in the illustration, which provides for quick replacements to keep machine "down" time at a minimum. Quick accessibility for making necessary adjustments or repairs is another advantage claimed for this new equipment.

Production with this machine is at the rate of approximately 100 parts per hour. This equipment completes 102 operations automatically on each engine block in 0.6 minute, including drilling, combination core-drilling and counterboring, chamfering, combination reaming and chamfering, combination reaming and counterboring, trepanning, and reaming.



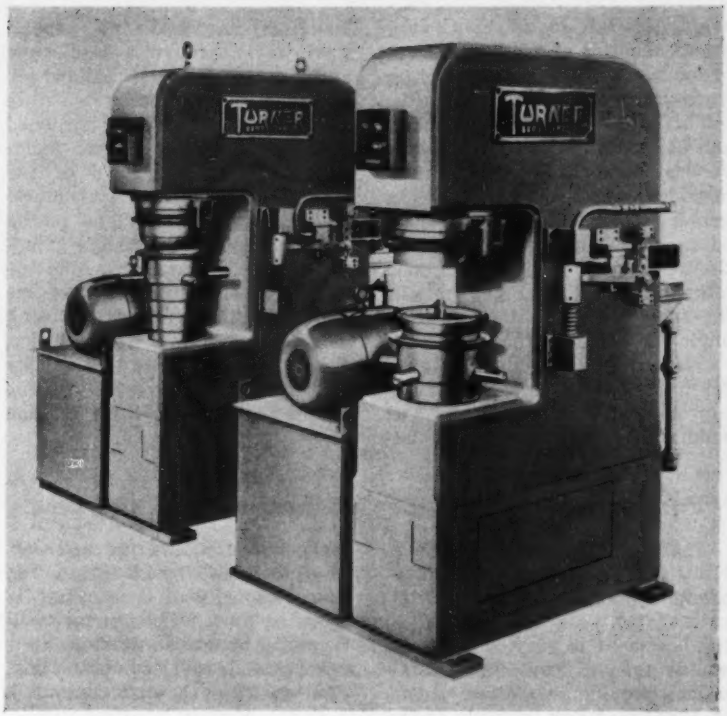
Dual-ram surface broaching machine placed on the market by American Broach & Machine Co.

Surface Broaching Machine

A dual-ram surface broaching machine of 4-ton capacity with a stroke of 30 inches has been added to the standard line made by the American Broach & Machine Co., Ann Arbor, Mich. The relatively short stroke and light tonnage of this SBD-30-4 machine make it particularly well adapted for the surface broaching of a wide range of small parts at a high production rate.

Tilting work-tables provide convenient loading positions for parts. The machine can be easily set up for operation on either an automatic or semi-automatic cycle. All electrical and hydraulic circuits are designed to conform to J.I.C. Standards.

Press built by Turner Bros., Inc., for precision assembling operation on fluid couplings



Hydraulic Precision Assembling Press

A 50-ton hydraulic assembling press is being manufactured by Turner Bros., Inc., 2625 Hilton Road, Ferndale, Mich., which is specifically designed to accurately maintain center distances in assembling the inner portions of fluid couplings.

The ram of the press is set by means of an indicator, the stroke being electrically and hydraulically controlled so that the assembly of the tree members is accurately maintained. This machine is said to save time as well as increase production.

Dynatomic Carbide-Tool Grinder

A machine designed to grind cemented carbide tools with special wheels developed to eliminate the necessity for using expensive diamond wheels has been brought out by the Dynatomic Corporation, 7 S. Dearborn St., Chicago 3, Ill. The new wheels are said to grind carbide tools at an exceptionally high speed and to produce a fine superfinish. They rough- and finish-grind the tools and permit the shank steel and carbide tip to be ground simultaneously.

No special skill is required to grind carbide tools with this machine. Attachments are available for grinding milling cutters, drills, and reamers. Other features of this equipment include automatic dynamic spindle and wheel balancing, vapor (air-oil) spindle lubrication, and provision for using a permanent Dynatomic grinding fluid.

Decomposition of the Dynatomic grinding fluid is said to reduce the generation of heat resulting from the grinding operation to a small fraction of that normally produced. The mere presence of the fluid on the wheel is said to give the desired results, but efficient operation is doubly insured by pumping the fluid through the spindle and wheel. An auxiliary jet on the wheel face, however, scrubs away loose abrasive and carbide and also prevents the wheel from becoming loaded. An extremely high grinding wheel speed tends to give the abrasive particles a high energy value,

Universal Dynatomic cutter, reamer, and drill grinding machine using special wheel

which, in conjunction with the chemical action of the fluid, serves to minimize energy adsorption on work and wheel contact surfaces.

This grinder is made in plain and universal models. A knee with vertical handwheel adjustment is provided on all models. The plain grinder has a tilting table mounted on top of the knee in front of the wheel face. Grinding is done offhand on this machine, the tilting table being set at the desired angle for grinding the tool.

The universal machine, designed for cutter, reamer, and drill grinding, has a saddle-table unit. The saddle provides for cross adjustment on hardened and ground steel ways through a lead-screw and micrometer dial handwheel. The table is mounted on two rows of balls which roll in hardened and ground V-ways. Two handknobs, one at each end of the table, are provided for table movement through a rack and pinion arrangement. For offhand grinding on the universal machine the tilting table is mounted on the ball bearing table, the latter being locked in place for the purpose. The plain machine can be quickly converted to a universal machine by placing a saddle-table unit on top of the knee.

"Portelvator" for Raising and Lowering Heavy Loads

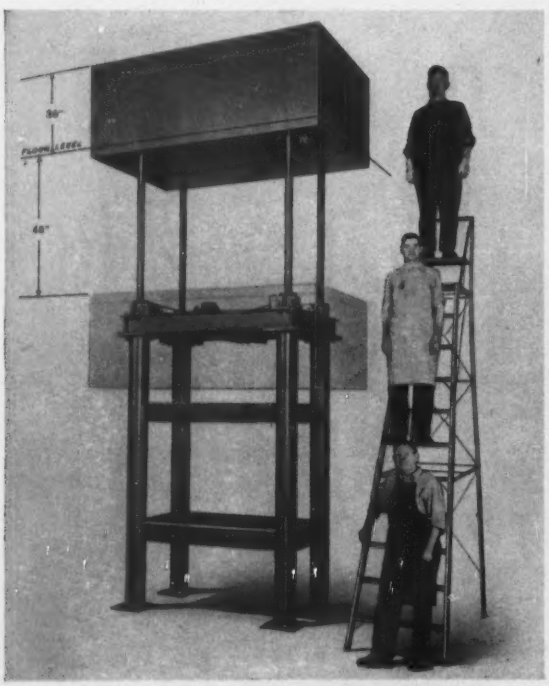
The Hamilton Tool Co., 834 S. Ninth St., Hamilton, Ohio, is manufacturing long-legged "Portelvators" that can be installed in the basement to service machines on the ground floor. Such installations provide an efficient means of handling many products at the entry and delivery ends of processing machines. The Portelvator shown in the illustration, for instance, was installed in a basement to serve a paper sheeting machine on the ground floor, and handled 6-foot stacks of sheeted paper at the delivery end of the machine. The table is 48 by 84 inches, has a load capacity of 3 tons, and is operated by a 2-H.P. motor with reversing magnetic starter, limit switch, and overload protection. The table is push-button operated.

Machine for Polishing Tungsten-Carbide Dies

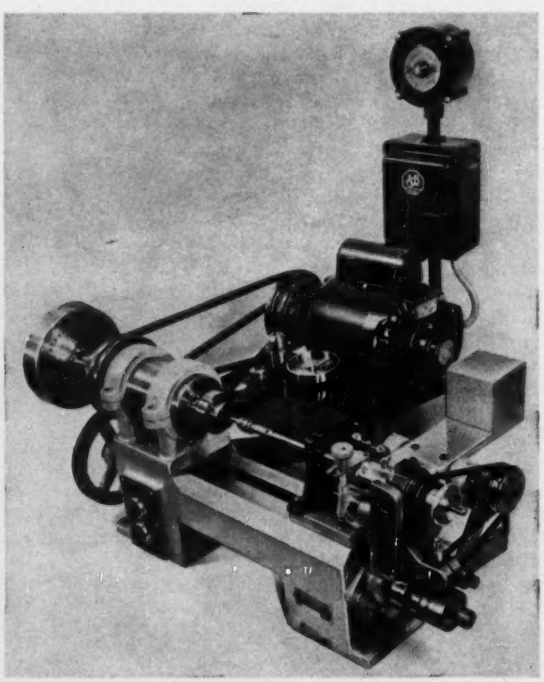
A machine for polishing and refinishing tungsten-carbide dies, with instant change-over from fully automatic to manual or semiautomatic operation, has been developed by the Dykrex Corporation of America, 33-35 Bloomfield Ave., Newark, N. J. This machine is said to give tungsten-carbide dies an exceptionally fine finish. It is a complete unit requiring no changing or removal of parts or attachments to adapt it for various operating methods. The design also permits quick changeover from one job to another. A timer switch is provided for semiautomatic or automatic operation.

Double-Ribbed V-Belt for Variable-Speed Motors

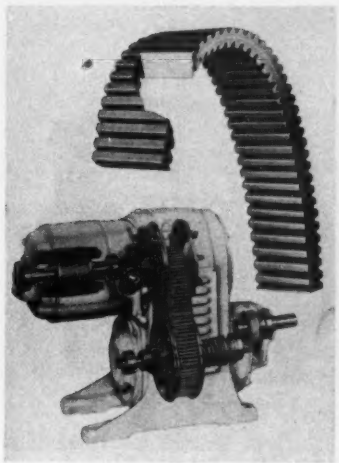
A double-ribbed V-belt developed to reduce internal friction and permit greater flexibility is now being used in Varidrive motor units produced by U. S. Electrical Motors, Inc., Box 2058, Los Angeles 54, Calif. The double-ribbed instead of the single-ribbed design makes greater speeds possible, and at the same time permits a reduction in the pulley diameters. This, in turn, allows more power to be developed within a smaller space than ever before. The outer periphery of the belt is relieved of destructive tensile strains while the inner periph-



"Portelvator" for raising and lowering heavy loads in servicing processing machines



Polishing machine for finishing tungsten-carbide dies made by Dykrex Corporation of America



Double-ribbed V-belt and phantom view showing its installation in motor drive manufactured by U. S. Electrical Motors, Inc.

ery is free from excessive compression.

Varibelts are constructed of synthetic rubber built up in layers and then cured under pressure in precision molds. Synthetic fiber is also employed to increase the strength 25 per cent or more and to permit the use of smaller cords to reduce heating. The Varibelt has exceptional resistance to heat, oil, and grease, and is protected from drippings and dirt by complete enclosure.

"Jet Blast" Liquid Abrasive Blasting Machine

Elimination of moving parts in contact with the abrasive is said to reduce maintenance costs of a redesigned "Jet Blast" liquid abrasive blasting machine announced by R. W. Renton & Co., 816 Addison Road, Cleveland 3, Ohio. This machine has been developed to clean, finish, burr, blend, or etch a wide variety of dies, molds, tools, etc., and is built for continuous service. The liquid "slurry" is drawn up by siphon injection and propelled from the blasting nozzle by means of a high-velocity air stream. A reversible pump located beneath the cabinet effects a complete change of the liquid abrasive slurry in less than five minutes.

The only moving part within the cabinet is the blower used for ventilation. Consequently, there are no critical wear points to necessitate frequent servicing. The size of abrasive particles, concentration of abrasives in solution, distance between nozzle and work, and air pressure can be varied to produce the particular results desired.

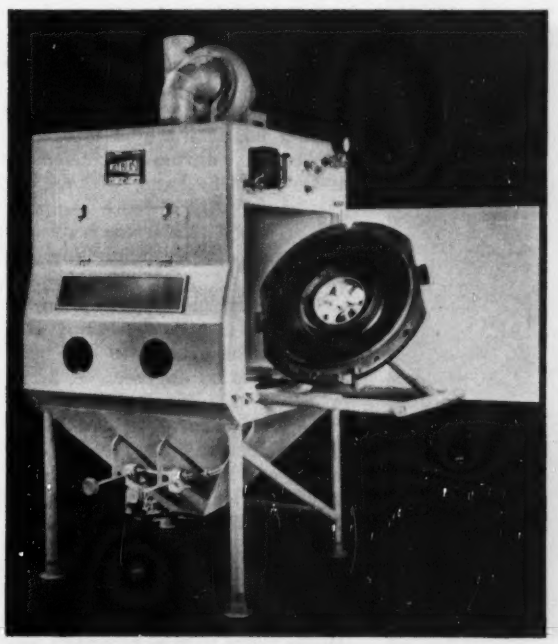
Work is inserted through the door at the side of the water-tight cabinet, and the operator reaches in through gauntlet-protected armholes. The work is held in one hand or placed on a table, while the abrasive stream is directed by the other hand. Full control is exercised over operation by means of conveniently located padded knee-pedals. One pedal governs the flow of abrasive slurry from the nozzle, and the other regulates cleaning of the light and observation port.

This "Jet Blast" machine is available in three standard models and can be furnished in almost any size required. It can be equipped with a turntable to speed handling of pieces, and can be furnished with up to eight fixed spray guns. In the larger models, the jets can be arranged to obtain automatic or semi-automatic operation.

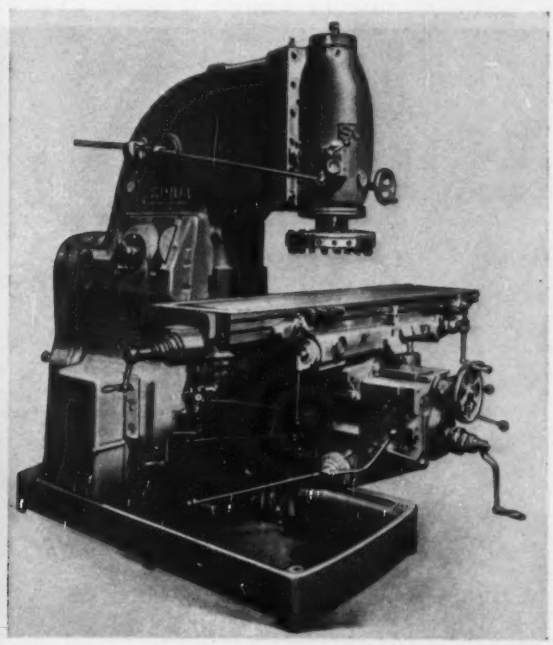
Somua Heavy-Duty Milling Machines

A heavy-duty No. 5 milling machine, made in universal, plain, and vertical types, is one of a complete line of Somua machine tools, built in France, which is now being distributed exclusively in this country by the Morey Machinery Co., Inc., 410 Broome St., New York 13, N. Y.

All three types of this machine are provided with automatic-cycle table control with dual control



Liquid abrasive blasting machine placed on the market by R. W. Renton & Co.



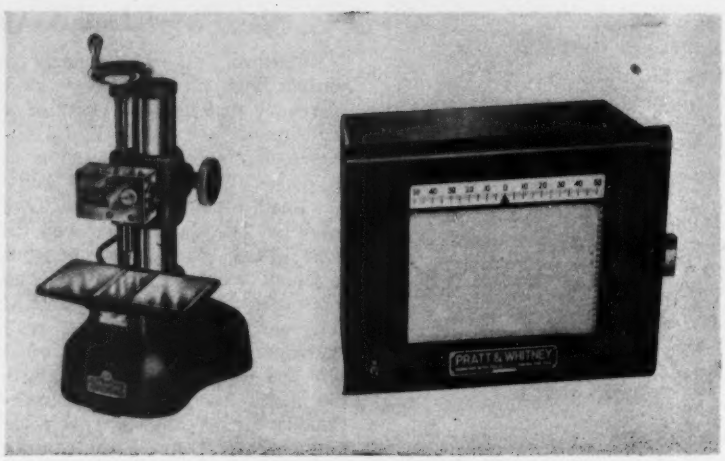
Somua heavy-duty milling machine introduced by the Morey Machinery Co., Inc.

at the rear of the table. Other features include a single lever to control both spindle rotation and automatic spindle speed changes; hydraulic speed change selector; mechanical feed change selector; and independent longitudinal, cross, and vertical feeds. Bearings are of the tapered anti-friction type and the feed drive is through bevel gears and shafts protected by telescopic tubes.

Pratt & Whitney "Electrolimit" Comparator

The universal "Electrolimit" circuit and gage-block comparator stand and the recently developed P & W electronic recorder have been combined by Pratt & Whitney Division Niles-Bement-Pond Co., West Hartford 1, Conn., to provide an instrument with a magnification of 110,000 to 1. Although primarily intended for checking precision gage-blocks to 0.000001 inch, this instrument is adaptable to many other uses in industry where the ultimate in accuracy is required.

The 11-inch scale of the recorder is equal to only 0.0001 inch with each primary division equal to 0.000005 inch and secondary divisions equal to 0.000001 inch. The electronic recorder is provided with a pen lifter and chart drive switch so that under normal operation it is used as an indicating instrument. By using the switch, however, the chart carriage is started and the measurements are actually recorded on the chart paper. Thus, the "Electrolimit Millionth Comparator" not only offers direct 0.000001-inch comparisons, but has the added feature of giving a permanent record.



"Electrolimit Millionth Comparator" with electronic recorder developed by Pratt & Whitney

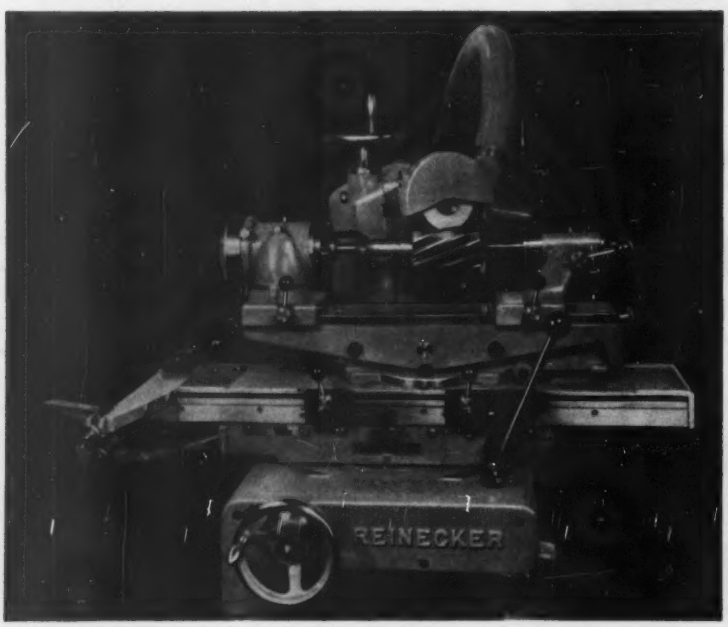
Reinecker Universal Tool and Cutter Grinder

Fast and accurate grinding of helical cutting tools, regardless of the operator's skill, is a major advantage claimed for the Reinecker Model WZS universal tool and cutter grinder being introduced in the United States by the Kurt Orban Co., Inc., 205 E. 42nd St., New York 17, N. Y. The work-table can be tilted horizontally or vertically through 10 degrees. This allows the face grinding of tapered tools between accurately aligned centers. A spiral grinding fixture permits the accurate grinding of helical cutting edges, on both straight and tapered tools, even when the edges have steep pitches.

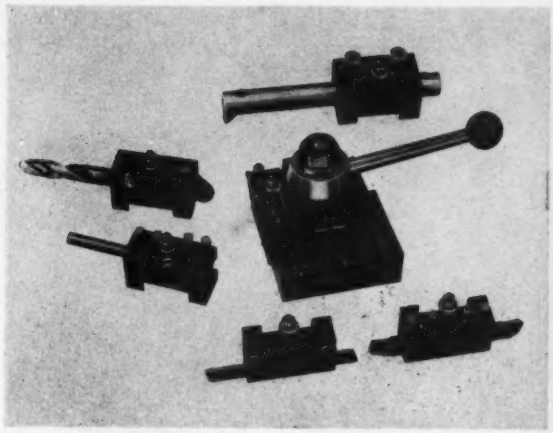
Helical-pitch generating of the cutting edge of a tool is accomplished by longitudinal movement of the table by hand, without the use of a cutting tooth support, two crossing guides and a system of rollers being employed for this operation.

The lower table swivels through 45 degrees in each direction. Tool faces can be ground to any helix angle up to 50 degrees. A hand-operated dividing head is provided for accurate three-dimensional settings. The wheel-dressing device can be employed for dressing both dish and cup wheels and is adjustable so that the line of the cone circumference is always in the theoretically accurate grinding plane.

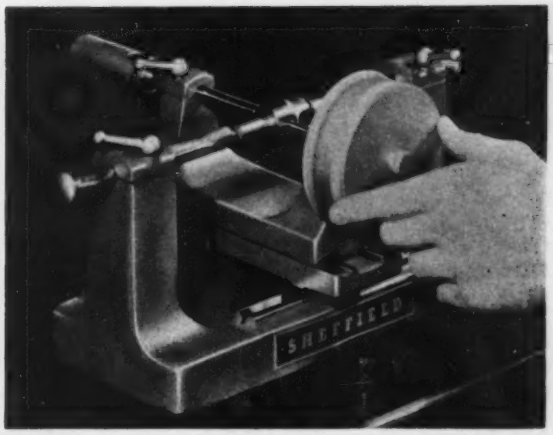
The work-spindle has a No. 4 Morse taper to take mandrels, collets, or tapered sleeves. Easy movement of the work-table is assured



Reinecker universal tool and cutter grinder introduced by the Kurt Orban Co., Inc.



Toolpost with five interchangeable tool-holders made by Aloris Tool Co., Inc.



Sheffield machine with floating carriage for the precision measurement of diameters

by mounting it on anti-friction bearings. Provision for tilting the grinding head 10 degrees up or down facilitates making adjustments for clearance angle of cutting edge. The angle can be easily read directly from a graduated scale.

This grinder is adaptable to the production or sharpening of hobs, drills, counterbores, reamers, milling cutters, and other tools. Spiral and tapered hobs can be sharpened with standard attachments. The grinders are designed for operation on standard American voltages and frequencies and have all calibrations in inches.

Aloris Toolpost with Interchangeable Holders

The Aloris Tool Co., Inc., 80-82 Fourth Ave., New York 3, N. Y., has developed a toolpost designed to fit the compound-rest top of any lathe. It is furnished with five interchangeable tool-holders, one for each of the following operations—turning, threading, drilling, cutting-off, and boring. The tool-holders can be changed in a matter of seconds by simply sliding out one holder and slipping another into the same pre-set position without changing the set-up. This feature permits resharpening the tool bits in the holder.

A stud screw is provided in each tool-holder for precision height adjustments, eliminating the use of shims. The rigidity of this toolpost and its holders is said to assure highly efficient work, especially when using carbide tool bits. The toolposts are made in three sizes with tool bit capacities ranging from 1/4 to 1 inch and capacities of boring-bars from 1/4 to 1 1/2 inches.

Variable-Speed Polishing and Buffing Lathe

Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo, Mich., has placed on the market a new 10-H.P. variable-speed polishing and buffing lathe. This Model 10 VRO lathe has a speed range of 1500 to 3000 R.P.M. The speed can be changed instantly while the lathe is in operation by turning the conveniently located dial control.

Diameter-Measuring Machine

Floating carriage diameter-measuring machines are recent additions to the line of precision inspection equipment offered by the Sheffield Corporation, Dayton 1, Ohio. These machines are available in three models of different capacities—up to 4 inches with 8 inches between centers, up to 7 inches with 12 1/2 inches between centers, and from 6 to 12 inches with 14 inches between centers. They are designed for rapid easy checking of all diametral thread elements without requiring a highly trained inspector.

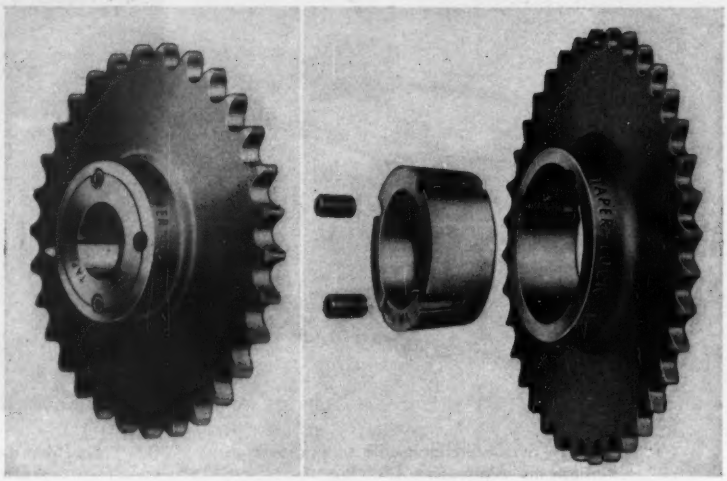
Hammond variable-speed polishing and buffing lathe

The machines consist of a cast-iron base with two accurately aligned and adjustable centers. At right angles to the axis of the centers is a freely moving measuring carriage mounted on balls in V-ways and carrying a micrometer and highly sensitive reference point indicator. This carriage permits measurements to be taken along the center line and at right angles to the work.

The micrometer unit has a large anti-glare matte-finished chromium drum, with clearly defined graduations. A vernier scale enables direct readings to 0.00001 inch. Non-rotating anvils are fitted to the micrometer in order to minimize wear at the point of contact. Reference point mechanical indicators enable the thread elements to be measured to within 0.00001 inch irrespective of the "feel" of the micrometer. The indicators have a fixed line and pointer giving a magnification of 350 to 1 on the micrometer anvil movement.

Dodge "Taper-Lock" Sprockets

The Dodge Mfg. Corporation, Mishawaka, Ind., is making a line of "Taper-Lock" sprockets and Dodge roller chains, which will be available from distributors' stocks for immediate application. These sprockets and their bushings can be had in a wide range of sizes. It is not necessary that shafts be turned and ground to obtain a tight-fitting sprocket. The "Taper-Lock" not only can be keyed to the shaft, but provides a grip having the firmness of a shrink fit. When a sprocket is to be replaced, however, it can be removed easily, and the bushing can be re-used.



"Taper-Lock" sprockets of new line introduced by Dodge Mfg. Corporation

The sprockets are compact and have no flange or protruding parts. They occupy no more space on the shaft than standard sprockets and the flush design contributes to safety. Both chain and sprockets are made to ASA standards. Distributors will stock a complete range of B type steel sprockets in 40 to 100 pitch. The range of from 11 to 112 teeth in the 50 pitch sprockets indicates the completeness of the line.

"Transfer-matic" for Machining Cylinder Blocks

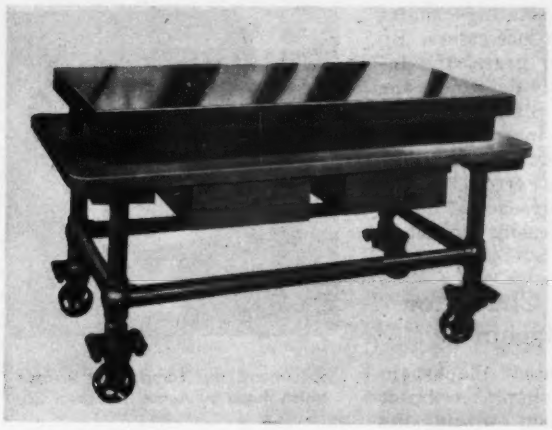
A "Transfer-matic" machine has been built by The Cross Company, Detroit 7, Mich., which performs 188 operations on a tractor-engine cylinder block. It mills the distributor boss; drills, bores, and spot-faces the distributor hole; drills, chamfers, and reams tappet holes; drills crankshaft and miscellaneous oil-holes; drills and reams oil filter and dipstick holes; drills, chamfers, and taps the cylinder head, distributor mounting, oil-pan, and bearing cap holes; and also taps certain oil-holes.

All operations are performed at the rate of seventy-two pieces per hour. The machine has twenty-two stations—one for loading, fifteen for machining, and six are idle. The cylinder blocks are automatically transferred from station to station. A Cross machine tool control unit is incorporated to automatically stop the machine when any tools need changing.

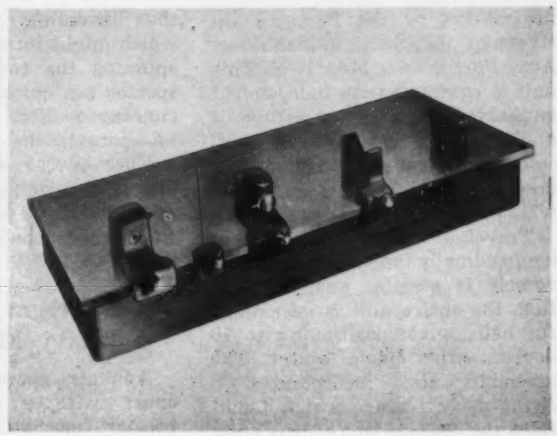
"Transfer-matic" built by The Cross Company for rapid machining of tractor-engine cylinder blocks

Portable Velsey Granite Surface Plate

The Elkro Co., 754 Albany St., Dayton, Ohio, has announced a line of portable granite surface plates designed particularly for the convenience of inspectors in tool-rooms and for other use in close-tolerance production. According to the manufacturer,



Portable granite surface plate brought out by Elkro Co.



Swanson unit for dimensional inspection of machined parts

these surface plates will retain their surface accuracy of 0.00005 inch over a period of years.

Louver-Cutting Attachment for Pullmax Machine

The American Pullmax Co., Inc., 2455 N. Sheffield Ave., Chicago 14, Ill., has announced a new set of specialized tools or attachments for the Pullmax sheet- and plate-working machines. These attachments are designed to cut louvers in steel and non-ferrous metals. The attachments permit the louvers to be cut and formed in one operation. Although the radius and opening of the louver remain constant, it can be cut to any length, a swinging die in the lower section being moved to either the right or left for forming the louver ends.

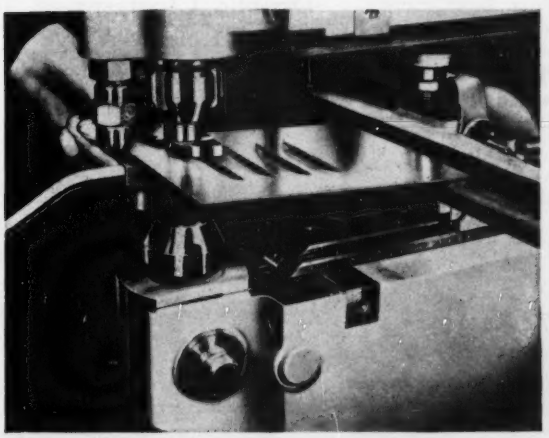
Inspection Unit for Checking Precision Parts

A fully integrated inspection unit incorporating all devices normally required for close dimensional checking of precision machined parts is being marketed by Swanson Tool & Machine Products, Inc., Erie, Pa. The basic unit includes five fundamental checking tools—surface plate, bench centers, V-blocks, sine plate, and indicator attachment—and in addition a concentricity attachment which permits rapid checking of relative diameters and bores in square or round parts of variable outside diameters. This is accomplished by a vertically adjustable V-block, positioned by a calibrated, direct-reading adjusting screw to compensate for diametrical differences up to 4 1/2 inches in shafts as large as 7 1/4 inches in diameter. No involved computation is needed. The opposed V-block is horizontally adjustable to accommodate parts up to 50 inches in length.

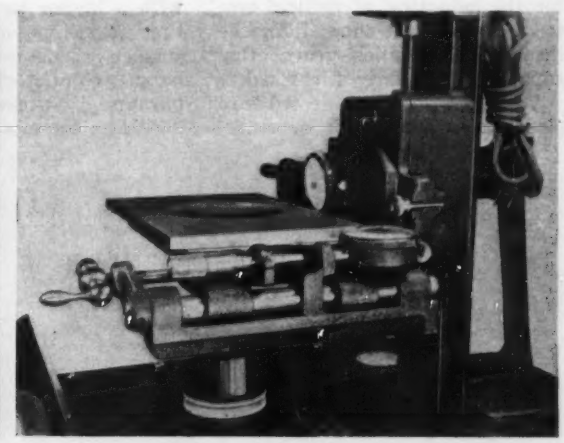
The surface plate is available in 12- or 24-inch widths, and is ground flat within 0.001 inch or scraped flat to within 0.00025 inch. The bench centers will accommodate shafts up to 48 inches in length and 8 inches in diameter. The V-blocks have a capacity for locating work up to 7 1/4 inches in diameter. The sine plate is made of hardened and ground tool steel.

Coordinate Stage for Optical Comparators

A universal type coordinate stage designed for use on the Model C-100 Portman optical comparator has just been placed on



Pullmax machine equipped with attachment for cutting and forming louvers



Portman optical comparator equipped with universal type coordinate stage

the market by the Portman Instrument Co., Inc., 6 Manhasset Ave., Port Washington, N. Y. This unit is equipped with independent measuring controls consisting of a combination of two dial indicators and two micrometer spindles for both longitudinal and transverse travel measurements.

Travel of a full 1 1/2 inches longitudinally and 1 inch transversely is possible and, in addition, the entire unit is adjustable for helix angle positioning to 10 degrees either side of center. The assembly also incorporates a swing-away feature which facilitates the change-over of lens units from one magnification to another without disturbing any work setups on the stage. The working platform area is 6 inches wide by 9 1/4 inches long, and is equipped with a 4-inch diameter removable glass stage insert disc for the location of parts to be inspected.

Gear Tester for Small Precision Gears

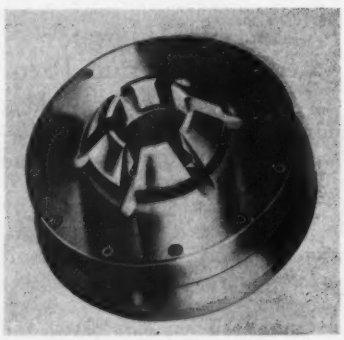
Small fine-pitch precision gears such as required for electronic controls can be tested on a new spur gear tester brought out by the George Scherr Co., Inc., 200 Lafayette St., New York 12, N. Y. The instrument base is a sturdy flame-hardened Meehanite casting designed to insure complete stability. A floating head resting upon ultra-precision steel balls provides extreme sensitivity. This head contacts a dial gage reading in 0.0005 inch.

A scale and vernier is furnished for measuring the center distance. The slides are drilled and tapped for the mounting of vertical center supports (not shown) for the inspection of pinion gears. One support is regularly furnished.

The gears to be tested are placed on fixed arbors or studs, thus avoiding rotating shafts which might introduce errors. By spinning the two gears, the inspector can quickly determine the running quality. Simple and easy to operate, the instrument will quickly reveal errors in center distance, spacing errors, eccentricity, and the presence of burrs. Backlash can be easily estimated.

Diaphragm Chuck for Heavy Machining

An air-operated diaphragm chuck with a simple, compact booster mechanism within the self-contained air cylinder is being manufactured by the Sheffer Collet Co., Traverse City, Mich. The actuating mechanism of this improved chuck is said to develop a thrust many times greater than a conventional air cylinder of equal size. The stepped-up power of this mechanism permits the use of a stiffer, heavier diaphragm with a higher torque factor, and thus makes possible a chuck of smaller diameter and less overhang. Overdistortion of the diaphragm is prevented by stops built into the mechanism.



Improved diaphragm chuck introduced by Sheffer Collet Co.

Specimens for comparing surface finish made by Acme Industrial Co.

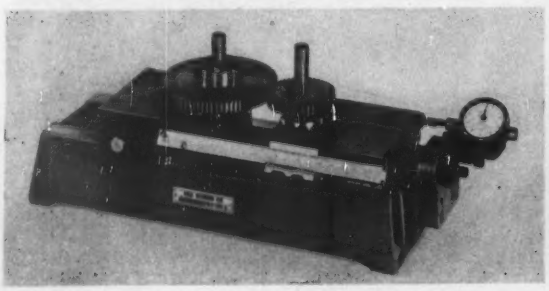
Specimens for Checking Surface Finish

A new line of roughness comparison specimens—also known as surface sticks—has recently been announced by the Acme Industrial Co., 200 N. Laflin St., Chicago 7, Ill. These specimens consist of various surface standards individually finished to definite microinch readings and grouped together in finish-comparison bars. The operator holds the bar opposite his work to check surface roughness, waviness, and lay.

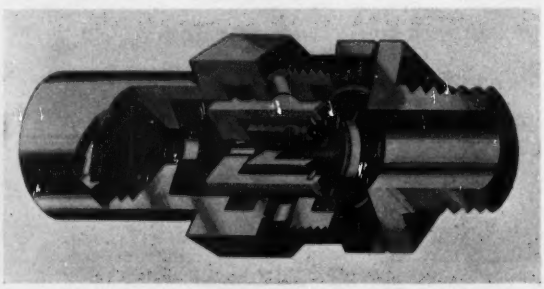
Surface finishes can be instantly compared and checked for conformity to specifications right at the machine. Acme roughness comparison specimens can be furnished in approximately 1 by 1 inch round plug form, and in approximately 1 by 1 1/2 by 1 inch rectangular blocks, in boxes accommodating three, five, or eight assorted surface finishes.

Deublin Chatterproof Quick-Release Valve

A quick-release valve which is guaranteed not to chatter has just been announced by the Deublin



Scherr testing instrument for small precision gears



Chatterproof air-valve made by the Deublin Co.

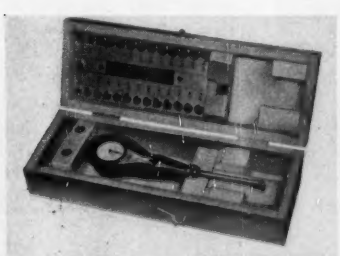
Co., 1155 Waukegan Road, Glenview, Ill. This valve is designed to handle air pressure from 0 to 250 pounds per square inch. Its light weight and compactness permit it to be used on rotating elements without disturbing dynamic balance. A built-in orifice prevents accidental removal of the orifice member from the line and eliminates the possibility of pressure equalization responsible for chatter. The double-piston design provides for smooth, positive, quick-releasing action. Special construction eliminates the need for a spring.

Dial Bore Gages

The Standard Gage Co., Inc., Poughkeepsie, N. Y., now has available complete sets of centering-size discs which permit measuring any bore within the over-all capacity range of 1/4 to 3/8 inch. Previously, the No. 00 gage was furnished with only one size of centering disc for checking a single dimension specified by the purchaser. Now, however, there are available complete sets of extensions covering any dimension within the range of the gage.

The set consists of twenty-seven centering-size discs mounted on a rectangular plate on which the size of each disc is marked plainly. The discs are interchangeable on the head, and are locked positively in the correct position by a clamping nut.

Outstanding features of this gaging equipment include the sapphire-tipped gaging plungers and the hard chromium-plated surface of the discs. The indicator has 0.0001-inch graduations and will cover a total tolerance as great as 0.005 inch. The gage can be used for checking the diameter of a blind hole to within 1/16 inch of the closed end.

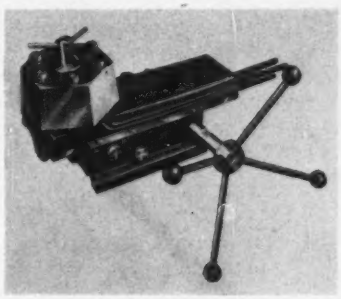


Set of centering-size discs for dial bore gage manufactured by Standard Gage Co., Inc.

Newton "Tilt-Head" Bed Turret

A versatile self-indexing Newton bed turret is being manufactured by the A. K. Tool Co., 2029 Blake Ave., Los Angeles 39, Calif. This bed turret is designed to swing tools as large as 6 inches in diameter over the ram and also provide a working travel of 7 1/4 inches. The clearance provided for large tools makes it possible to use a wider variety of tooling. Despite its extra clearance, the tools are said to always remain in accurate alignment with the machine spindle.

The indexing bed turret has ground bearing surfaces on the slide and selective fitting of key parts. A new type tapered locating pin, which works in a sleeve bearing and locates in a mating seat, is used to assure accuracy. All parts are made of tool steel which has been heat-treated to tool bit hardness, ground, and honed for a precision fit.

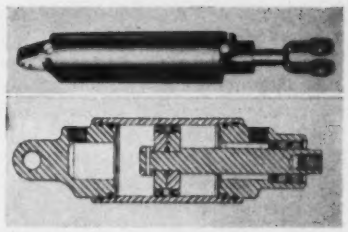


Newton "Tilt-Head" bed turret announced by A. K. Tool Co.

A long working stroke and a very short indexing stroke are features of this turret. A clutch arrangement provides for either manual or automatic indexing. For extra heavy cuts where extreme rigidity is desirable, a ram lock and head lock give the added stability needed. The turret is designed for use on most 10-, 11-, and 12-inch lathes.

Improved Key Type Pneumatic Cylinders

Carter Controls, Inc., 2800 Bernice Road, Lansing, Ill., has brought out an improved key type pneumatic cylinder. A new cartridge rod bearing has been developed for this cylinder to aid in servicing and in reducing wear caused by misalignment. Included in the cartridge unit are a long bronze rod-end bearing, rod packing, and a self-centering packing at the pivot point. This cartridge can be replaced without disassembly of the cylinder by removing a snap-ring, pulling out the cartridge, and dropping in a new one.



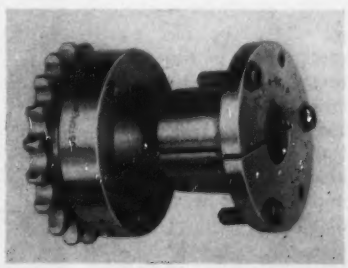
Pneumatic cylinder announced by Carter Controls, Inc.

The cast-steel mounts and the head and rod caps of the cylinder are integral units. These combinations are easily disassembled by removing the internal locking key ring which unites the head and cylinder wall.

Heavy-wall tubing, chromium-plated rods, a rod scraper, and milled wrench flats on rods are standard for all cylinders. The cylinder heads are locked in place in a counterbored section of the tubing wall at the ends of the cylinder. Pipe ports can be oriented at random due to the 360 degree rotation of the ends. Made in bore sizes from 1 1/2 to 8 inches, inclusive, with stroke lengths up to 18 feet.

"Shold-A-Grip" Bushings and Sprockets

The Boston Gear Works, 14 Hayward St., Quincy 71, Mass., has announced an interchangeable split tapered bushing which makes



"Shold-A-Grip" bushing and socket placed on the market by the Boston Gear Works

it possible to use the same size Boston sprockets on shafts from 1/2 inch to 2 1/2 inches in diameter in steps of 1/16 inch. This eliminates the need for reboring stock sprockets to fit particular shafts, thus saving the time and cost of reboring, keyseating, and tapping for set-screw.

The bushing is drawn into the tapered hole in the sprocket by tightening cap-screws. As both the inside and outside diameters of the bushing and the bore of the sprocket are ground, the bushing grips both the sprocket and the shaft with the equivalent of a press fit, even on shafts that are under size as much as 0.005 inch.

The mating "Shold-A-Grip" sprockets have a shoulder on the hub, allowing room between the teeth and the shoulder for chain clearance. Because the bushing is screwed to the shoulder, and because the diameter of the shoulder is not limited by chain clearance, the sprocket can be manufactured with a maximum size bore and minimum number of teeth. This sprocket is available from stock in sizes from 1/2-inch pitch up to and including 1 1/4-inch pitch. Both bushing and sprocket are of machine steel and can be case-hardened.

"Loadmeter" Developed to Control Carbide Tool Wear and Breakage

A device for controlling wear and for limiting breakage of carbide tools has been placed on the market by the Detroit Milling Cutter Co., 28625 Grand River, Farmington, Mich. The "Loadmeter," as this instrument is called, works on the ammeter principle to show the percentage of motor capacity being used, including overloads.

The overload recorded when the tool becomes dull is first determined by visual inspection of the tool. A red auxiliary pointer is then set for this overload on the "Loadmeter," and when the black pointer reaches the red one, the tool should be changed. Correct settings can be made for any motor ranging from 1 to 50 H.P. A colored dial registers green when the machine is operating from 0 to 100 per cent of rated motor capacity, yellow from 100 to 125 per cent, pink from 125 to 150 per cent, and red above 150 per cent.

Device developed by the Detroit Milling Cutter Co., to indicate when tools should be reground

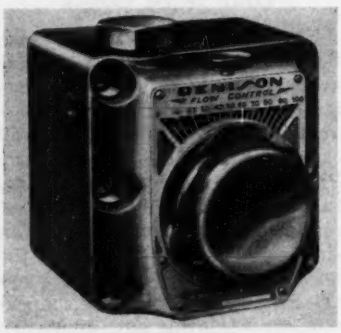
Taft-Peirce Computing Air Gage

A computing "CompAIRator" with three dials, which replaces six standard type indicators for checking the center distance, bend, and twist of a connecting-rod, has been developed by the Taft-Peirce Mfg. Co., Woonsocket, R. I. This air gage unit is designed to take full advantage of air gaging in solving multiple and complex measuring problems encountered in checking tapered cylindrical parts, center distances between bores, squareness between face and bore, concentricity, etc.

Computing type air gage equipment for checking connecting-rods

Hydraulic Multi-Range Flow Control

A multi-range flow control valve for hydraulic systems has been brought out by the Denison Engineering Co., 1160 Dublin Road, Columbus 16, Ohio. This valve is designed for operating pressures up to 3000 pounds per square inch and is offered in two- and three-port types in 1/4-, 3/8-, and 3/4-inch sizes for sub-plate mounting. It is available either with or without built-in checks. With this pressure compensating type control, the oil flow can be maintained at a uniform rate regardless of circuit pressure variation, thus insuring smoother operation and freedom from erratic motion.



Denison multi-range flow control for hydraulic systems

The two-way adjustable orifice provides not only 100 per cent regulation of oil flow within a given range, but also a choice of ranges to accommodate low- or high-volume systems. A knurled dial adjustment locking screw limits each range of control. To change the range, the screw is turned outward. This releases the single-cartridge type spool so it can be rotated in increments of 180 degrees until the desired maximum range of flow is reached. Thus, should the flow requirements of a circuit change, the orifice may be adjusted to control a smaller or larger delivery and still provide a 100 per cent scale adjustment of the selected volume. This control can be used in bleed-off, meter-in, or other work cycle circuits.

HIGH SPEED

Screw
Machine
Equipment

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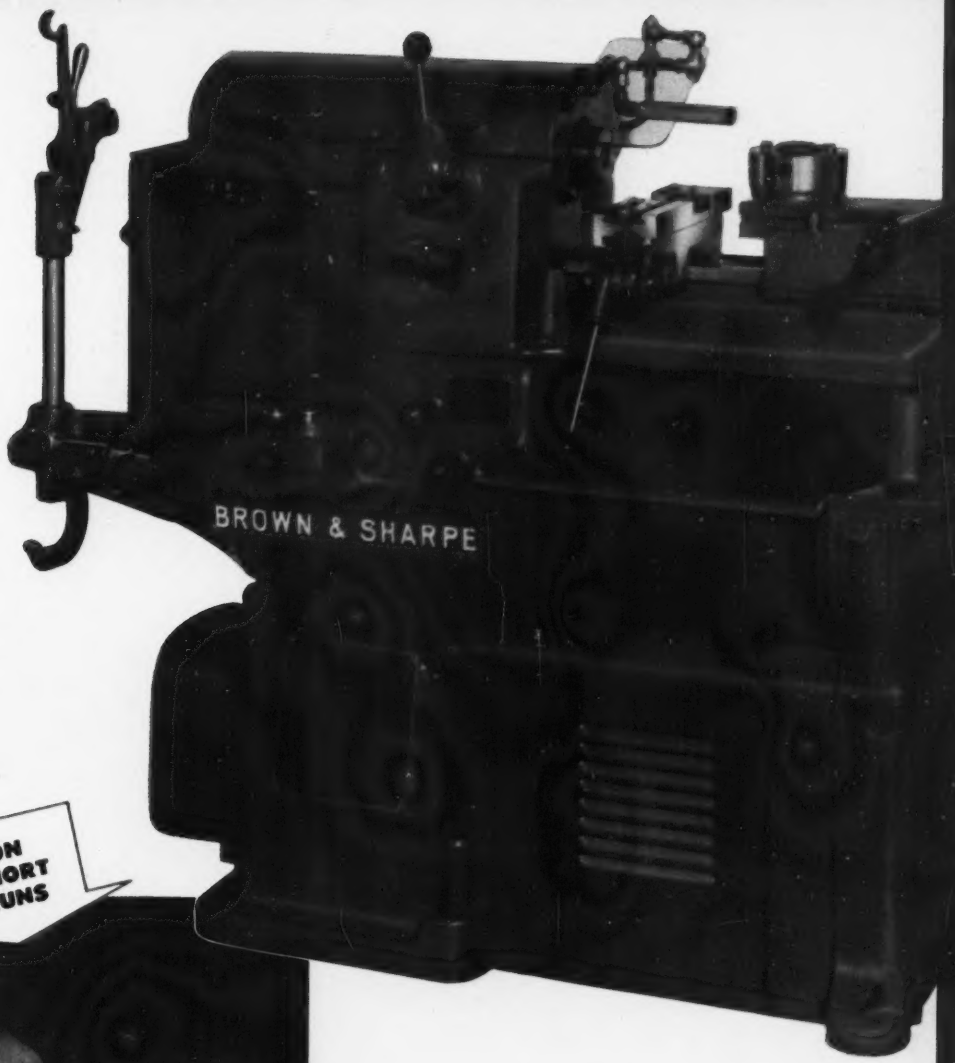
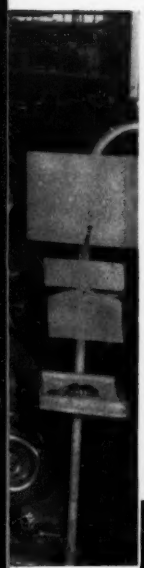
"Speed-up" your Screw Machine Departments...

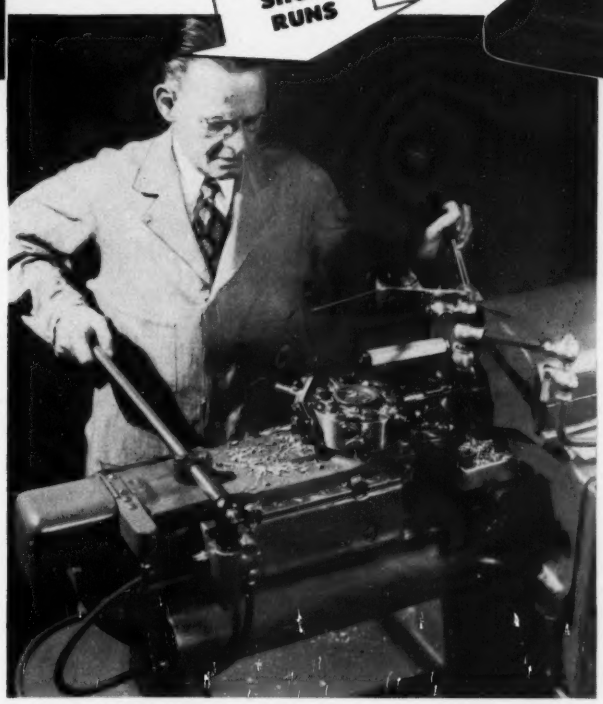
Brown & Sharpe

Automatic Screw Machines Nos. 00G (illustrated), 0G, 2G, and the new No. 4

Minimum cost per piece on long and moderate runs is assured with these fast-operating Automatic Screw Machines. Their rapid non-cutting movements, together with wide range of spindle speeds and speed ratios, "speed-up" each operation . . . permit top cutting efficiency on a broad variety of materials. Positive chain drive delivers full power at all speeds. The many attachments available extend the work capacity of these Automatics and often completely eliminate second handling. The three smaller machines are also made in Automatic Cutting-Off types for manufacture of precision parts requiring only forming and cutting-off.





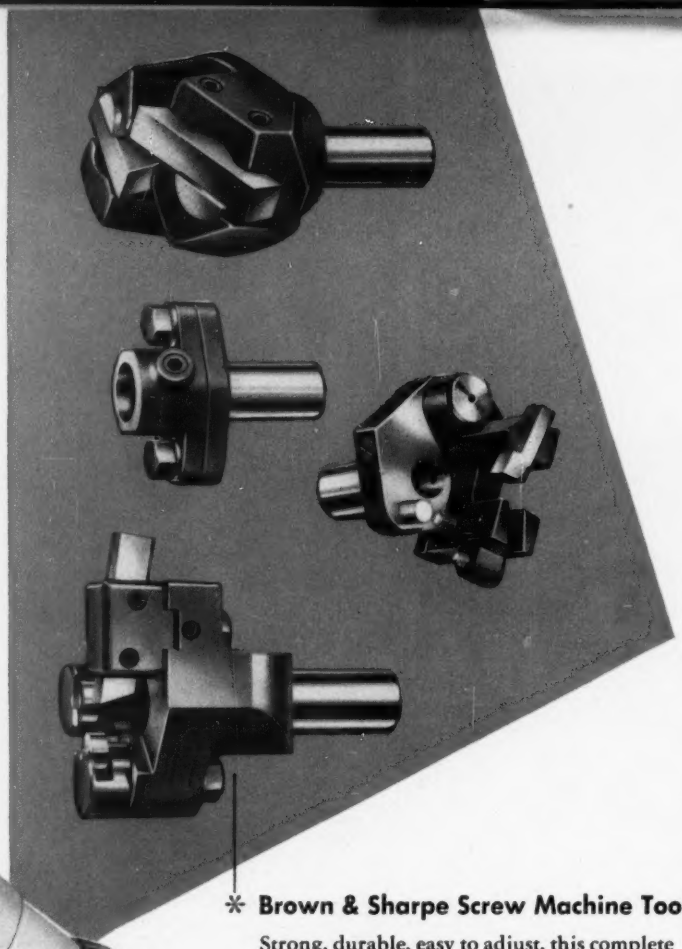


Brown & Sharpe

Hand Screw Machines Nos. 00, 0 (illustrated), and 2

Jobs of small or moderate quantities are more quickly handled on these easy-to-set-up Hand Screw Machines. They perform the same operations as automatics, but do not require cams or timing . . . make short runs and second operation work highly profitable. Due to their ease and simplicity of operation, these Hand Screw Machines are often used to do jobs that would otherwise interrupt long runs on automatics. Tooling is economical inasmuch as they use many of the same tools, collets, and fingers as the automatics. They are a worthwhile addition to any screw machine department.

To Insure Fast, Accurate Screw Machine Production



*** Brown & Sharpe Screw Machine Tools**

Strong, durable, easy to adjust, this complete line of screw machine tools is engineered for uniformly accurate production of fine finish work, at low cost.

*** New Brown & Sharpe Micrometers**

Many new and exclusive features have been designed into these micrometers. Maximum wear resistance is provided by carbide measuring surfaces and one-piece hardened stainless steel spindle and screw with ground threads. Jet black numerals on satin chrome finish make reading easier . . . more accurate.

Write for complete information on any of these Brown & Sharpe Products
BUY THROUGH YOUR LOCAL DISTRIBUTOR

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Milling Machines • Grinding Machines • Screw Machines • Cutters • Machine Tool Accessories
Machinists' Tools • Electronic Measuring Equipment • Johansson Gage Blocks • Permanent Magnet Chucks • Pumps

BROWN & SHARPE MFG. CO., PROVIDENCE 1, R. I., U. S. A.

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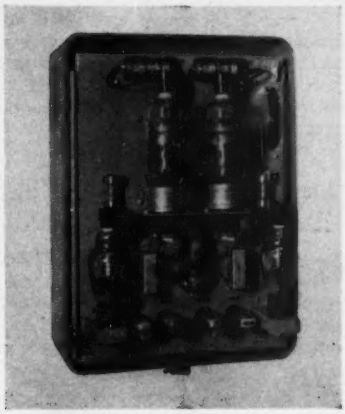
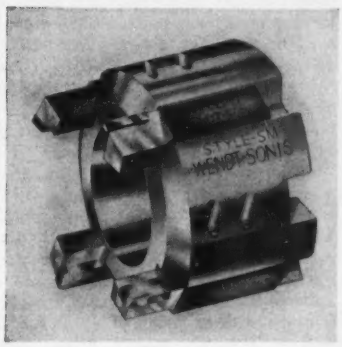


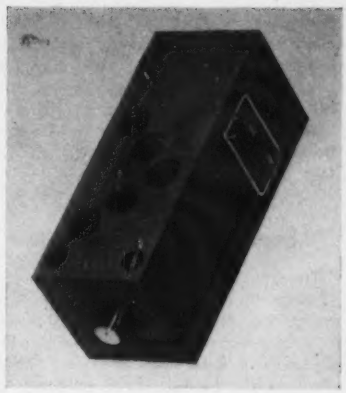
General Electric Simplified "Thy-mo-trol" Drive

Simplified unit added to the line of "Thy-mo-trol" packaged electronic adjustable speed drives made by the General Electric Co., Schenectady 5, N. Y. Designed for use on many types of equipment, including testing machines, printing presses, conveyors, variable-volume or proportioning pumps, and machine tools, for 3/4- to 3-H.P. drives. It provides stepless speed control, pre-set speed control, and close speed regulation, and includes the smallest G-E "Thy-mo-trol" drive panel, measuring 15 by 18 by 12 1/2 inches. The drive is offered in standard speed range ratios of 5 to 1 and 20 to 1, and comes in both reversing and non-reversing forms.

Carbide-Tipped Shell Mills with Lapped Blades

Smoother finishes and closer tolerances are said to be possible with this standard inserted-blade shell mill, manufactured by the Wendt-Sonis Co., Hannibal, Mo. All blade slots are finish-ground to precision tolerances, and the blades are ground on both locating sides to assure minimum run-out. The carbide cutting edges are diamond lapped. The blades can easily be removed for free-hand grinding to a template, or they can be precision-ground in the cutter body. Two styles of blades are available for steel, non-ferrous metal, and cast-iron milling. The shell mill sizes range from 3 to 6 inches and are available in four- and six-blade styles, the four-blade style being shown in the accompanying illustration.



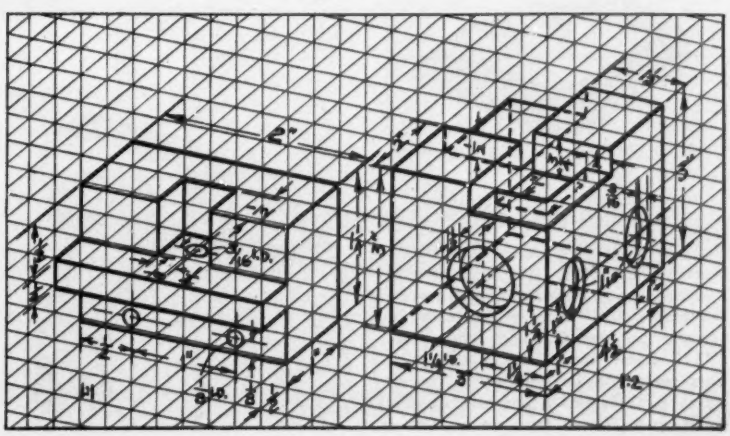


High-Pressure Precision Control Valves

Mechanically operated control valve for follow-up "booster" type positioning systems in a wide variety of horsepower and flow ranges for system pressures up to 3000 pounds per square inch. The valve features linear flow output and precision adjustment of piston land and sleeve port spacing for optimum neutral position characteristics. Can be supplied either for manifold mounting or threaded for pipe or tube fittings. Nitralloy moving parts are used to insure long service life and smooth operation. Pistons are lapped to close fit in bores to minimize internal leakage. Product of Hydraulic Controls Co., 87 Terrace St., Roxbury 20, Mass.

"Dimetric" Graph Sheets

View showing arrangement of guide lines on "Dimetric" graph sheet for sketching machine parts and details. This sheet is available in pad form from John R. Cassell Co., Inc., 110 W. 42nd St., New York 18, N. Y. It is based on an exact mathematical calculation, and is a part of the "Instrumaster" line of isometric and "Dimetric" ellipse stencils and other accessories developed to promote axonometric drawing. The actual sketching sheets are a very fine translucent vellum, and the plate is printed in invisible ink so that the lines may be readily followed when sketching, but will not reproduce in blueprints or black and white prints.



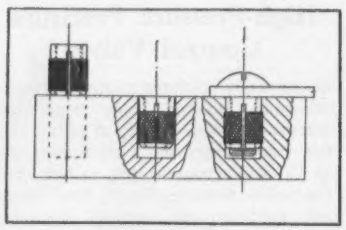
Coolant Pump Unit

Medium-duty portable coolant pump unit announced by the Shellback Mfg. Co., 11831 Hamilton, Detroit 3, Mich. This Model 8-5 unit with a 1/15-H.P. motor was designed for machines without built-in coolant pumps not requiring the extreme capacity of the manufacturer's heavy-duty Model 10-10 unit. It pumps 12 gallons per minute against a 4-foot head and 5 gallons

per minute against an 8-foot head. The centrifugal pump has a full-floating balanced impeller and cast-aluminum housing. The heavy-gage steel tank has a capacity of 5 gallons, and is equipped with chip screen and heavy bail handle. The unit is 21 inches high and 11 inches in diameter.

Screw-Locking Insert

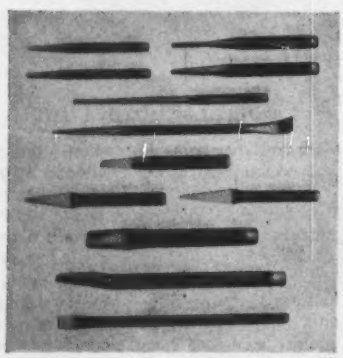
"Knurled insert" device for providing threads in blind holes in all kinds of materials, recently added to the line of fastening devices made by the Brush Nail Expansion Bolt Co., Greenwich, Conn. This insert operates on

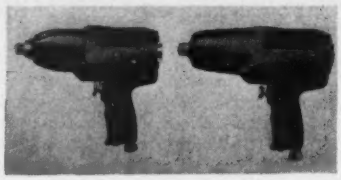


the three-stage principle shown in the section views. The insert has a large band of diamond knurling on its gripping area. This knurling provides an efficient contact when used in hard and dense materials, such as molded plastics or metal castings, and also provides high resistance to torque. Standard knurled inserts are made from aluminum, but are available in other materials and in a range of sizes to accept screws from 4–40 to 1/4–20.

Williams Line of Punches and Chisels

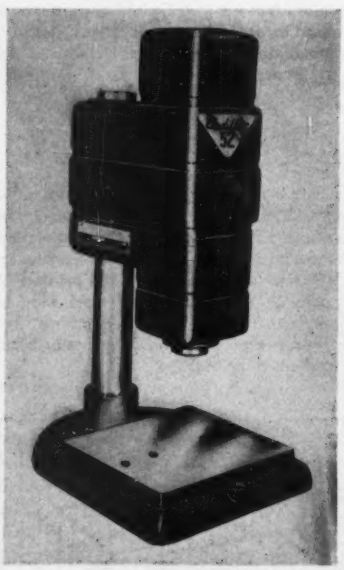
Punches and chisels of an expanded line, manufactured by J. H. Williams & Co., 400 Vulcan St., Buffalo 7, N. Y. This line includes cape chisels, diamond point chisels, round nose chisels, extra long cold chisels, and pinch bars. The assortment is available in a full range of sizes, forged from high-grade octagon alloy steel. These tools are hardened and tempered to withstand severe service.





Air-Operated Pneumatic Impact Wrenches

Two new sizes of air-operated impact wrenches have been added to the line of portable air tools manufactured by the Master Pneumatic Tool Co., Inc., Orwell, Ohio. These tools are designed for use in driving bolts, studs, and almost all threaded fasteners in assembly and sub-assembly operations. They have also proved satisfactory for tapping. Models M960 and M970 have nominal capacities for 5/8- and 3/4-inch diameter bolts, respectively. The smaller wrench weighs 9 pounds 10 ounces and is 9 3/4 inches long. It has a free run down speed of approximately 5000 R.P.M. and a 5/8-inch square drive for receiving sockets and attachments. The larger wrench weighs 11 pounds, is 10 5/8 inches long, and has a free run-down speed of 4500 R.P.M. and a 3/4-inch square drive. Both tools operate on air pressures of from 80 to 100 pounds per square inch.



Air Impact Press

An air impact high speed assembling, marking, branding, staking, crimping, riveting, and light-stamping press—designated the "52" — has been developed by the Cadillac Stamp Co., 17315 Ryan Road, Detroit 12, Mich. This press can be operated at speeds up to 10,000 strokes per hour at pressures up to 8 tons from an air line at 100 pounds per square inch. It is adjustable from light to heavy marking, and can be regulated to give the proper cam action required for branding or color-leaf marking. Hand, foot, or electrical controls can be used.

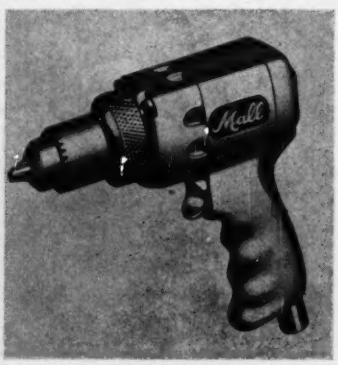
Device for Safety Testing Electric Tools and Cords

Device known as the "Pow-R-Safe" tool tester, said to accurately detect electrical defects in electric hand tools and extension cords. The safe working condition of such electric hand tools as

drills, screwdrivers, nut-runners, saws, grinders, sanders, and soldering irons, together with their electric cords, can be determined in less than ten seconds by simple finger-tip controls. Preliminary tests are conducted at a safe 6 volts to avoid electrical shock. Introduced by the Fendall Co., 4633 N. Western Ave., Chicago 25, Ill.

Mall Heavy-Duty Pneumatic Drill

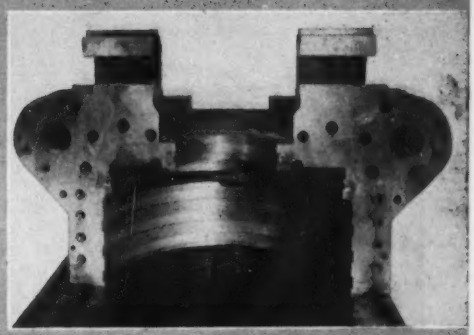
Pneumatic drill designed by the Mall Tool Co., 7725 S. Chicago Ave., Chicago 19, Ill., for heavy-duty operations with maximum power on continuous runs. This PD-304P pneumatic drill is of compact design with pistol grip, trigger throttle, and speed regulator arranged for easy handling. It has its own built-in oiler, and all moving parts run on precision ball bearings. The length is 6 13/32 inches, width 2 1/16 inches, height 6 1/2 inches, and weight 3 pounds.



BICKFORD *for big work...*

This powerful Cincinnati Bickford Super Service Radial Drill was purchased to facilitate handling of "big work." It was the right machine for the job. In the complete line of Cincinnati Bickford Radial Drills, with their many outstanding features, is the right machine for you.

Write us for descriptive literature, or consult our Engineering Department on drilling needs.



Photos—Courtesy Worthington Corporation, Steam Turbine Division, Wellsville, N. Y.

Here 3" pipe tap holes are being drilled and threaded in 3000KW Turbine Generator End Casing.

CINCINNATI
BICKFORD

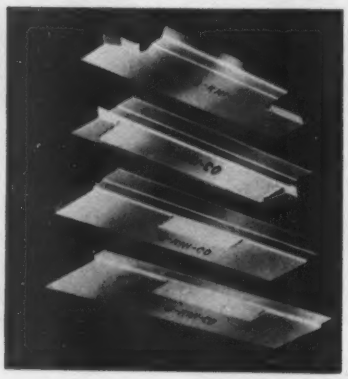
RADIAL AND UPRIGHT DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO.

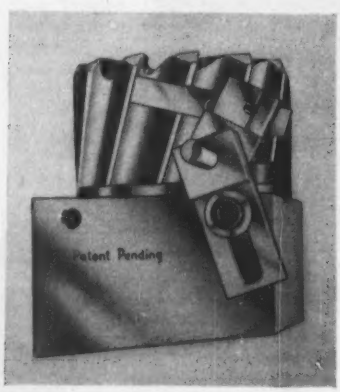
Cincinnati 9, Ohio, U.S.A.

Work-Rest Blades for Centerless Grinders

The Ohio Knife Co., Dreman Ave., Cincinnati 23, Ohio, is offering a line of centerless grinder work-rest blades and guides of the design here illustrated. Special heat-treating of these high-speed steel blades is said to assure extreme hardness and long life, as well as to enable them to produce high

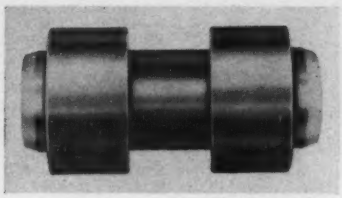


finishes and maintain close tolerances on the work. Inserted carbide blades and blades of cast alloys or iron are also available. In addition to standard sizes, blades with special angles, contours, or shapes can be supplied to meet specific requirements.



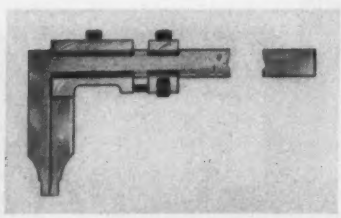
"Wesgan" Fixture for Grinding and Sharpening Teeth of Milling Cutters

Fixture for use in grinding and sharpening the teeth of shell mills, side-milling cutters, and inserted-tooth milling cutters, called the "Wesgan." This fixture is designed to adapt a surface grinder for cutter grinding, and can also be used to advantage on cutter grinders. It is of simple construction, thus eliminating the need for highly skilled mechanics. Placed on the market by the Westcott Chuck Co., Lock Drawer 270, Oneida, N. Y.



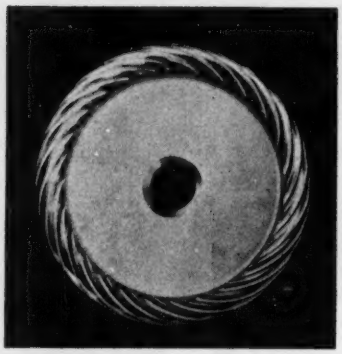
Spacer Type Gear Coupling

Gear coupling that can be disconnected in a matter of seconds without wrenches or special tools has been announced by the Sier-Bath Gear & Pump Co., Inc., 9252 Hudson Blvd., North Bergen, N. J. This coupling makes it possible to remove the hubs from either shaft without disturbing the mountings of the connected units. The simplified method of closure makes possible quick assembling and disassembling. Available in stock sizes from 7/8 inch to 3 inches, for 4 to 80 H.P. per 100 R.P.M. Spacer lengths range from 4 3/8 to 3 7/8 inches.



Large-Size Vernier Calipers

Vernier slide calipers in sizes from 10 to 96 inches made by Schweitzer in Germany, now available in this country from Glogau & Co., Inc., Department E, 1914 Birchwood Ave., Chicago 26, Ill. These calipers are made of hardened chromium steel, with sharp, accurate machine-divided graduations to provide precision readings or settings to 0.001 inch. The jaws are hardened, ground, and lapped, and vernier slides are fitted tightly and slide smoothly. Precision-made vernier height gages of similar construction in sizes from 12 to 48 inches are also available. The calipers and height gages are provided with fine wooden cases.

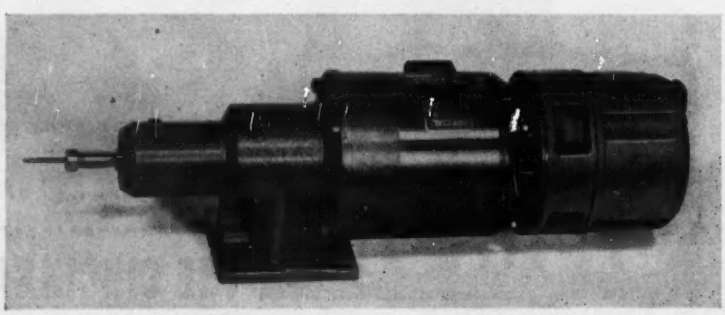


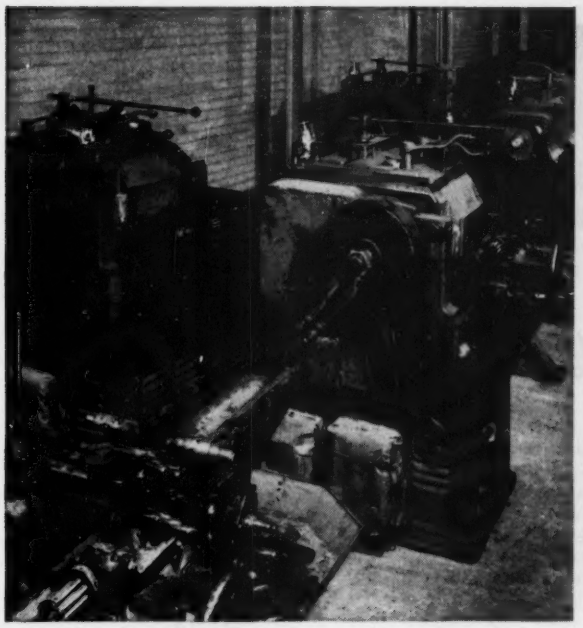
High Helix Milling Cutter

High helix, shear type milling cutter with a cutting surface of more than 90 degrees has been designed to mill compound contoured surfaces. The teeth of this cutter are designed to maintain continuous contact with the work-piece, are self-cleaning, and impart a very smooth finish to the machined surface. The cutter is suited for machining turbine compressor blades, stator vanes, buckets, and generating cams. A special adapter is provided which makes possible its use on any milling machine. Announced by the Douglas Tool Co., 2300 E. Nine Mile Road, Hazel Park, Mich.

Simplex Automatic Tapping Head

Self-contained automatic tapping head recently redesigned for quick interchangeabilty of different pitch leadscrews for producting Class 4 threads in open or blind holes. The motor is spline connected to the tapping spindle. Different lead screws can be readily mounted. Depth of tapping is predetermined and set. The cycle is automatic through tapping, stopping, reversing, backing out, and stopping. Spindle speed is at 1650 R.P.M. or 825 R.P.M. Threading capacity is from 0–80 to 3/8 inch. Made by Simplex Tool Engineering Co., 2540 Park Ave., Detroit 1, Mich.





HYDRAULIC SYSTEMS CONTAMINATED by external rust preventive which had seeped into the working parts, Hoffman anticipated a complete machinery teardown.

CLEANED WITHOUT TEARDOWN. Sunvis H.D. 700 Oils freed hydraulic systems and internal parts, enabled Hoffman to start production within the time specified by the Navy.

HYDRAULIC SYSTEMS OF MOTHBALLED MACHINES CLEANED WITHOUT TEARDOWN BY SUNVIS H.D. 700 OILS

Recently the U.S. Hoffman Machinery Corporation was asked to reopen a World War II Navy-owned shell-making plant and start production in three months. The machinery, idle for 5 years, had been protected by an external layer of rust preventive. Hydraulic lines were among the parts coated, and some of the protective material had seeped into them. It looked as if the machinery might have to be torn down to be cleaned.

Sun and several other oil companies surveyed the equipment and suggested cleaning methods. Hoffman chose Sun's recommendations because of their soundness and Sun's record for reliable service in other Hoffman plants. Sunvis H.D. 700 Oils freed up the hydraulic systems, many of which were extremely sluggish; and the detergency of these oils flushed away every trace of sludge and rust preventive. Sun Spirits did the external cleaning job. No dismantling of equipment was necessary.

Let Sun help you solve your hydraulic, metalworking and lubrication problems. Write for your copy of "Sunvis H.D. 700 Oils" or for the services of a Sun representative, without obligation, of course. SUN OIL COMPANY, Department M - 4, Philadelphia 3, Pa.

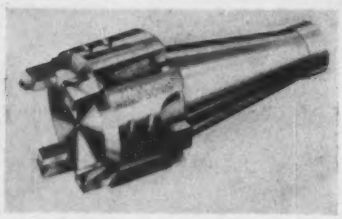
SUN INDUSTRIAL PRODUCTS

SUN OIL COMPANY, PHILADELPHIA 3, PA. • SUN OIL COMPANY, LTD., TORONTO AND MONTREAL

SUNOCO

Universal Fly Cutter

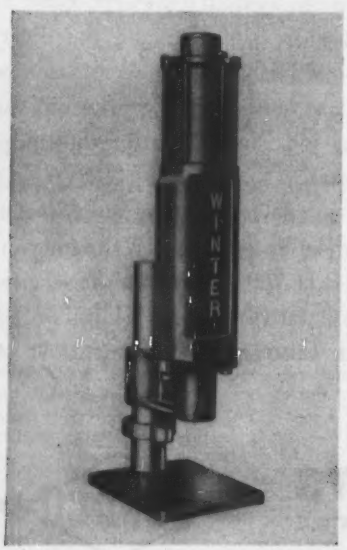
Universal fly cutter now being manufactured by the Wendt-Sonis Co., Hannibal, Mo. This tool is said to produce exceptionally smooth finishes and permit work to be held to very close tolerances. Blade slots in the cutter body

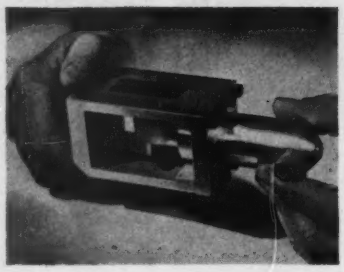


are milled and finish-ground to precision tolerances. The blades are also ground on both locating sides to assure accurate positioning in the cutter body. Sizes for the fly cutters range from 3 to 6 inches in four- and six-blade styles.

Controlled-Power Safety Press

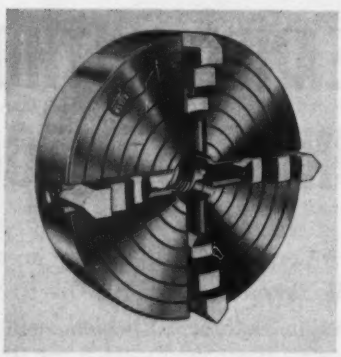
Improved Model RR-7 controlled-power safety press of increased impact capacity and simplified mechanical design, brought out by Winter Products, Inc., Box 3112, Barnum Station, Bridgeport 5, Conn. This bench type air- and spring-powered press is adapted for light staking, assembling, and marking operations where high-speed operation, precise control of power, and maximum operator safety are important considerations. Outstanding features are continuous hairline adjustability of impact from 0 to 12,000 pounds and adjustability of squeeze pressure up to twelve times the air-line pressure. Pedal or two-hand release can be used.





Explosive-Driven Guillotine Chopper

Guillotine chopper designed to sever bundles of cables 1 1/2 by 2 1/4 inches or fluid lines as large as 1 1/2 inches in diameter by means of an explosive-driven chopper blade. One model has a chopper blade which is driven by means of a 38-caliber special propellant cartridge. The firing pin for this cartridge is actuated remotely by explosive cordeau, ignited electrically from a special explosion valve that incorporates safety devices to prevent premature operation of the chopper. Explosive-actuated chopper devices of this type, controlled by radio or other signal, are used to jettison sections of a vehicle. Introduced by Beckman & Whitley, Inc., 922 San Carlos Ave., San Carlos, Calif.

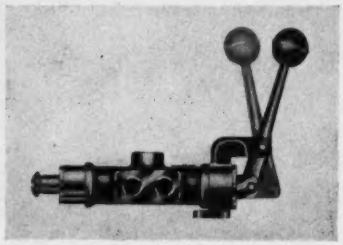


Westcott Chuck with Threaded Hub

Recent addition to the line of lathe chucks made by the Westcott Chuck Co., Oneida, N. Y. This 8-inch four-jaw independent chuck is threaded for direct mounting on lathes, milling machines, grinders, and other machine tools with spindles having 2 1/4–8 threads. The chuck can be mounted close to the spindle bearing. It has a body 2 1/8 inches thick, and the center hole diameter is 1 9/16 inches.

Control Valve for Air Line

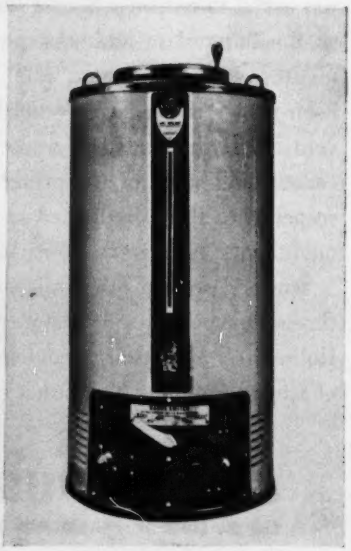
Valve with two built-in speed controls designed primarily to adjust the stroke of an air cylinder. The built-in controls eliminate the need for installing separate units, simplify the piping, and effect cost saving of 50 per cent. Available in a standard four-way exhaust model for 3/8-inch pipe. Knob, lever, clevis, foot, cam, cylinder, solenoid, and diaphragm controls are avail-



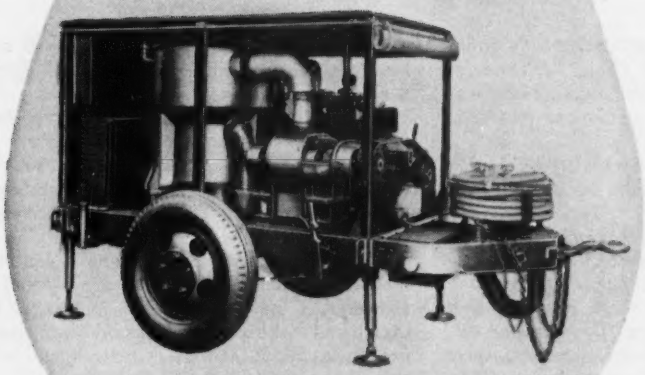
able for actuating the valve. Placed on the market by the Valvair Corporation, Akron, Ohio.

G-E Alternating-Current Welder

Single-phase 400-ampere welder with a 60 per cent duty cycle transformer, marketed by the General Electric Co., Schenectady 5, N. Y. This welder, designated G-E Type WK40K, provides a current range of 40 to 500 amperes, and can be used with a variety of electrode sizes for repair, maintenance, and construction work. The new transformer of this welding equipment is designed to assure quick starting. Arc-stabilizing capacitors facilitate striking and maintaining an arc without pop-outs. These features are said to result in faster travel speeds, fewer "patch ups," and stronger welds. The extra wide current range provides for a variety of applications, from light-duty, low-current sheet-metal jobs to heavier duty, high-current industrial work.



FRESH WATER FROM THE SEA ...?



Portable Diesel-driven sea-water compression still, producing 35 gallons of pure water per hour. Made by Cleaver-Brooks Company, Special Products Division, Waukesha, Wis., which also makes stationary installations for chemical, paper, pharmaceutical and similar plants, for production of pure water or recovery of valuable by-products.

USE REVERE METALS!

This is a portable compression still, which produces pure distilled water from the sea at the rate of 85 gallons per hour. It is made by Cleaver-Brooks Company, Special Products Division, Waukesha, Wis., an important producer of stills, either portable or stationary, for the Armed Forces and for industry. An important feature of Cleaver-Brooks design is the selection of metals in accordance with the water conditions to be met, whether salt, brackish, contaminated, or requiring recovery of valuable by-products. Thus, for example, the heat exchanger, of the tube-within-a-tube type may have cupro-nickel tubes and headers, or Admiralty tubes, naval brass, silicon bronze, according to the nature of the service. Such care in selection of metals is in part at least responsible for the high reputation Cleaver-Brooks enjoys.

In addition to supplying Revere Metals, we were also requested to collaborate with engineers and production men on fabrication methods, including forming, brazing, welding and annealing. Cleaver-Brooks is a large and well-staffed company, and its experience is such that it is capable of conducting its operations unassisted. However, like so many companies, it likes to have others double-check its conclusions and methods, to protect itself and its customers. The Revere Technical Advisory Staff was glad to respond to the call.

Such work is typical of the collaboration Revere offers to you through its salesmen, its Technical Advisors, and the Research Department. Remember, we do not take the place of your own engineers, designers and production people; we consult with them, and make our knowledge freely available, on a confidential basis, of course. Call the nearest Revere Sales Office. Consult your telephone book or write direct.

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COPPER AND BRASS INCORPORATED

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"R B & W took us off a *hot spot* by cold-forging this key fitting"

● *"You know how important that little fitting is, Joe,"* continued Mr. Tobin. *"It connects the oil line to this filter we* make, and it was this component that gave us one headache after another."*

"How did you clear up the trouble?" Joe asked, as he peered at the oil filter he had seen on so many cars.

Well, these spuds, as they are called, used to be machined from bar stock. If there were checks or seams in the bar, the machining process failed to detect them. Realizing that spot checking would not eliminate our difficulty, we were forced to magnetically inspect every single spud. This magnetic inspection threw production costs out of line on such a small item. It also showed us that a sizeable part of our production had to be rejected, thus indicating that a change of the production method was necessary.

"Then one of our men thought of RB&W and it wasn't long before their engineers came up with the idea of cold-forging this fitting. Cold-forging made the spud stronger and eliminated the danger of cracking and leaking. It also made the fitting easier to weld to the filter. As a bonus, they even did away with one of the machining operations by forging a countersink at the same time they forged the fitting. Now we're getting better spuds at lower cost in less time — and we no longer need the magnetic inspection."

Maybe this sounds like a special case to you, but it puts in sharp focus RB&W's down-to-earth engineering skill, as well as our practical experience in designing and fabricating the kind of fasteners that can solve your assembly problems.

Most of your fastener requirements can be met with standard products from our stock. However, if the unusual is called for, we'll design and make it for you—as efficiently and quickly as we turned out a better spud for this filter manufacturer.

Remember—for any fastening job, it's a smart move to call in RB&W. You can count on RB&W bolts, nuts, screws, and rivets for uniform accuracy, dependability and physical properties. And you can also count on fast service from RB&W's strategically located plants at: Port Chester, N.Y., Coraopolis, Pa., Rock Falls, Ill., Los Angeles, Calif. Additional sales offices at: Philadelphia, Pittsburgh, Detroit, Chicago, Dallas, San Francisco. Sales agents at: Portland, Seattle. Distributors from coast to coast.

RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY

*Fram Corporation, East Providence, R. I.

R B & W 108 YEARS MAKING STRONG THE THINGS THAT MAKE AMERICA STRONG

PRODUCT INFORMATION SERVICE

Use the postage-free postcard below for further information on New Catalogues described in the April, 1953, issue of MACHINERY. Circle key number of item in which you are interested and print name and address on postcard.

NEW CATALOGUES

INDUSTRIAL X-RAY ACCESSORIES—Westinghouse Electric Corporation, Section X, 2519 Wilkens Ave., Baltimore 3, Md. Catalogue 404-000, consisting of a buying guide of accessories and supplies required for industrial X-ray installation. Can be obtained when requested on a company letterhead direct to the above address.

FINISHING SYSTEMS—Cincinnati Cleaning & Finishing Machinery Co., Schmidt Bldg., Cincinnati, Ohio. Catalogue illustrating and describing a variety of finishing systems and equipment involving the steps of pre-paint treatment, finish application, and baking or drying. Can be obtained if request on company letterhead is directed to above address.

ELECTRIC HEATERS AND HEATING DEVICES—General Electric Co., Schenectady, N. Y. Catalogue GEC-1005D, consisting of 60 pages of technical data on Calrod electric heaters and heating devices. In the nature of a buying guide, the equipment is described in terms of application, special features, installation, and pricing. 1

PRODUCTION ILLUSTRATION—TM Publishers, Inc., Chicago, Ill. Bulletin TM-3, entitled "How to Prepare Perspective Drawings for Training Literature," in which ways and means are suggested and illustrated by which manufacturers can use perspective drawings to bridge the gap between untrained workers and the completion of their tasks. 2

TEMPERATURE AND CONDUCTIVITY CONTROLLERS — Leeds & Northrup Co., Philadelphia, Pa. Catalogue ND47, containing complete data on the company's electronic instruments—the Electromax temperature controllers and the Electromax conductivity controllers. The three types of temperature controls provided by the Electromax are explained. 3

TOOLPOST GRINDERS — Dumore Co., Racine, Wis. Catalogue 53, descriptive of the company's toolpost grinders, hand grinders, flexible shaft tools, automatic drill heads, light drilling equipment, and drill grinders. Operating and design information is given about these precision tools. 4

BRASS ALLOY—American Brass Co., Waterbury, Conn. Publication B-39 on Formbrite, intended for applications where the metal is to be drawn or formed into products on which finishing is an important cost factor. 5

HERRINGBONE GEAR DRIVES—Link-Belt Co., Chicago, Ill. Book 2519, giving detailed information on Link-Belt single, double, and triple reduction enclosed herringbone gear drives. Installation photographs show examples of these drives in service. 6

HOLE PUNCHING UNITS—Wales-Strippit Corporation, North Tonawanda, N. Y. Catalogue CJ, on Wales hole punching units that punch mild steel up to 1/4 inch thick, and on notching units for punching and notching set-ups. Illustrated units are concisely described. 7

ROLL-FORMING — Roll Formed Products Co., Youngstown, Ohio. Catalogue 1053, showing production procedures and advancements in the roll-forming field. Illustrated are some of the roll-formed shapes produced by the company from ferrous and non-ferrous materials. 8

TORQUE CONVERTERS—Detroit Diesel Engine Division, General Motors Corporation, Detroit, Mich. Folder explaining the operating principles of the GM Diesel engine torque converter unit—a combination torque converter and fluid coupling integral with the engine. 9

STAMPING AND FORMING MACHINES—U. S. Tool Co., Inc., Ampere (East Orange), N. J. Bulletin 15, describing U. S. Multi-Slide machines for the automatic high-speed production of precision metal stampings from coil stock. Specifications for the four sizes of machines built are given. 10

HORIZONTAL BAND SAWS—Wells Mfg. Corporation, Three Rivers, Mich. Catalogue G-52, describing a line of horizontal metal-cutting band saw machines, as well as special heavy-duty saws designed for unusual cut-off jobs. Included is a reference chart for the proper selection of blade, feed, and speed. 11

PYROMETERS—General Electric Co., Schenectady, N. Y. Bulletin GEC-713B, describing design features and applications of indicating and controlling pyrometers for the indication and control of temperature in industrial processes and for the protection of heat-processing equipment. 12

INTERNAL GRINDERS — Bryant Chucking Grinder Co., Springfield, Vt. Booklet entitled "Alignment for Better Internal Grinding," explaining how the proper alignment of an internal grinder will assist the user to produce more accurate holes on a production basis. 13

MILLING MACHINES—Cincinnati Milling Machine Co., Cincinnati, Ohio. Catalogue M1760 on the new Cincinnati No. 2-24 automatic milling machine designed in three styles—plain, plain rise and fall, and duplex. Dimensional drawings are given. 14

SLITTERS—Yoder Co., Cleveland, Ohio. 73-page manual giving basic information on the design, selection, and operation of slitters and slitting lines, as well as engineering data on Yoder rotary gang slitters, uncoilers, scrap choppers, recoilers, and unloaders. 15

LUBRICANTS — Pure Oil Co., Chicago, Ill. Booklet entitled "How to Simplify and Save with Pure Industrial Lubricants," setting up six simple steps intended to streamline the lubrication program for the average plant. 16

SILICONE RUBBER—Chemical Division, General Electric Co., Pittsfield, Mass. Bulletin CDS-13 entitled "Silicone Rubber: A New Insulating Material for Wire and Cable," consisting of a reprint on the processing of silicone rubber. 17

ROLLER CHAIN—Baldwin-Duckworth Division of Chain Belt Co., Springfield, Mass. Catalogue 52-1, containing 54 pages of information on Baldwin-Rex roller chain and sprockets. Included is a section on how to select standard roller chain drives. 18

OPTICAL FLATS—Crane Packing Co., Chicago, Ill. Bulletin 1-404 on how to measure flatness through light band readings with Lapmaster monochromatic lights and optical flats. The step-by-step explanation may be used as a wall chart. 19

MOTOR STARTERS — Arrow-Hart & Hegeman Electric Co., Hartford, Conn. Folder describing the Type "RA-V" magnetic motor starters with vertical overloads below contactor for use with the Crouse-Hinds explosion-proof conduit. 20

ROTATING ELECTRICAL EQUIPMENT—Electric Specialty Co., Stamford, Conn. Catalogue 53 P-D, descriptive of the company's facilities for building specially designed motors, motor generator sets, dynamotors and converters to exact requirements. 21

CONTROL CENTERS — Allen-Bradley Co., Milwaukee, Wis. Bulletin 798, describing multiple-unit control centers. One feature of the bulletin is "Pattern for Planning a Control Center" in which lay-out charts and floor arrangements aid in simplifying planning. .. 22

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RESISTANCE WELDING ALLOY—Ampco Metal Inc., Milwaukee, Wis. Bulletin RW-1a, presenting information on Ampcoloy resistance welding alloys and parts. Included is information on the newly designed tips and holders recently added to the Ampco Weld line. 23

CLUTCHES—Formsprag Co., Van Dyke, Mich. Folder descriptive of Formsprag clutches designed for such functions as over-running, indexing, and backstopping. Application and engineering data are included. 24

CONTROL INSTRUMENTS—Brown Instruments Division, Minneapolis-Honeywell Regulator Co., Philadelphia, Pa. Catalogue 1530, comprising 56 pages of factual information on Electronik control instruments for all types of process applications. 25

SURFACE GRINDERS—DoAll Eastern Co., Inc., New York City. Leaflet on a new line of DoAll precision surface grinders for handling a variety of surface grinding, cylindrical grinding, and form grinding jobs. 26

GEAR COUPLINGS — Sier-Bath Gear & Pump Co., Inc., North Bergen, N. J. Catalogue C-4, explaining the advantages and illustrating typical applications of Sier-Bath flexible gear couplings. Engineering data are included. 27

AIR-OPERATED CONTROLLERS — Bristol Co., Waterbury, Conn. Bulletin A120, giving data on the free-vane air-operated controllers produced by the company for the automatic control of pressure, temperature, liquid level, etc. 28

PHOTOELECTRIC RECORDERS — General Electric Co., Schenectady, N. Y. Bulletin GEA-5536, describing applications of the G-E photoelectric recorder, such as in metals testing, fatigue testing, and strain measurement. .. 29

HEAVY-DUTY LATHES—Atlas Press Co., Kalamazoo, Mich. Catalogue C-1-A, describing the Clausing heavy-duty general-purpose precision lathe for production, tool-room, maintenance, automotive, school, and commercial shops. 30

DRILL UNITS — Delta Power Tool Division, Rockwell Mfg. Co., Pittsburgh, Pa. Catalogue AD-723, containing extensive engineering data on Delta drilling units, which are designed for mass production work. 31

INDUSTRIAL CHILLING UNITS — Sub-Zero Products Co., Cincinnati, Ohio. Booklet describing and illustrating Sub-Zero units for low-temperature industrial and laboratory chilling, together with specifications. 32

STEEL BARS—La Salle Steel Co., Chicago, Ill. Bulletin 8, describing the properties and applications of La-Led free-machining lead-bearing steel bars. Seven case histories are presented. 33

CLAMPING TOOLS — Wilton Tool Mfg. Co., Chicago, Ill. Catalogue 109, describing and illustrating a complete selection of clamping tools, vises, clamps, work positioners, and other hand tools made by the company. .. 34

LATHES — South Bend Lathe Works, South Bend, Ind. Catalogue 5216, featuring the South Bend Light Ten precision lathe, with concise descriptions of the various models. 35

LITERATURE ON COPPER AND BRASS PRODUCTS—Chase Brass & Copper Co., Inc., Waterbury, Conn. Bulletin listing nearly seventy catalogues and technical handbooks on copper and brass products. 36

RHEOSTATS—Ward Leonard Electric Co., Mount Vernon, N. Y. Bulletin 60a, listing the company's complete line of power rheostats for industrial control applications. 37

METAL-FINISHING—Promat Division, Poor & Co., Waukegan, Ill. Leaflet on Promat agents for metal cleaning, baths for plating, and coatings for protection. 38

GEAR DRIVES—U. S. Electrical Motors Inc., Los Angeles, Calif. Bulletin descriptive of the Hollohaft gear drive, designed to operate vertical turbine pumps where electricity is not available. 39

CASTING FACILITIES—Frank Roth Co., Inc., New York City. Leaflet describing the company's facilities for casting all types of ferrous and non-ferrous metals and alloys. 40

DIE-FINISHING MACHINES—Wm. K. Stamets Co., Pittsburgh, Pa. Bulletin 100-E on Stamets die-finishing machines for precision boring and grinding of tube-reducing dies. 41

POWER SAWS—Skil Corporation, Chicago, Ill. Manual on cutting applications with a Skil portable power saw. Blade selection, cutting techniques, and various materials are considered. 42

SPACING COLLARS—Dayton Rogers Mfg. Co., Minneapolis, Minn. Leaflet descriptive of the Dayton Rogers micrometer adjustable spacing collars for milling machine cutter arbors. .. 43

ARC-WELDING ACCESSORIES — Westinghouse Electric Corporation, Pittsburgh, Pa. Booklet B-5451, supplying specification data on the Westinghouse line of arc-welding accessories. 44

ELECTRONIC PYROMETER CONTROLLERS — Bristol Co., Waterbury, Conn. Bulletin P1248, descriptive of the company's free-vane electronic pyrometer controllers and their use. 45

CARBON STEELS—Peter A. Frasse & Co., Inc., New York City. Chart which offers assistance in identifying Government specifications covering carbon steels. 46

HEAT-TREATING FURNACES—Eclipse Fuel Engineering Co., Rockford, Ill. Bulletin D-50, on the Eclipse gas-fired pot furnaces for hardening and drawing operations with lead or heat-treating salts. 47

TOOL-BLOCKS AND TOOL-HOLDERS—Marvic Inc., San Mateo, Calif. 38-page booklet describing the operation of the Marvic System for holding cutting tools for lathe operations. 48

BAND MACHINES — DoAll Eastern Co., Inc., New York City. Folder illustrating applications of DoAll saw band machines and other band tools. 49

BRONZE WELDING ALLOYS—Titan Metal Mfg. Co., Bellefonte, Pa. Folder outlining chemical and physical properties of Titan bronze welding alloys. 50

MARKING STAMPS AND DIES—Parker Stamp Works, Inc., Hartford, Conn. Catalogue descriptive of marking stamps and dies for industrial applications. 51

ALLOY TUBING STEELS — Babcock & Wilcox Co., Beaver Falls, Pa. Bulletin TDC-146, giving condensed data on Croloy 5 steel pipe and tubing. 52

WELDING ROD — Wall-Colmonoy Corporation, Detroit, Mich. Folder 102, describing properties, application methods, and typical uses of Colmonoy No. 1 hard-facing welding rod. .. 53

DUST COLLECTORS—American Air Filter Co., Inc., Louisville, Ky. Folder descriptive of Roto-Clone dust-controlling equipment. 54

CHUCKS—Westcott Chuck Co., Oneida, N. Y. Catalogue 753, describing and illustrating the full line of Westcott chucks. 55

END MILLS AND COUNTERBORES — Besly-Welles Corporation, Beloit, Wis. Catalogue describing a new line of Besly high-speed end mills and counterbores. 56

GRINDERS—Dynatomic Corporation, Chicago, Ill. Leaflet describing the Dynatomic single-point grinder for grinding cemented-carbide tools and its cost-cutting features. 57

METAL CLEANING—Lukens Steel Co., Coatesville, Pa. Guidebook entitled "Cleaning and Maintenance of Clad Steel Equipment," outlining recommended cleaning procedures. .. 58

COUPLINGS—American Flexible Coupling Co., Erie, Pa. Bulletin 1052, explaining the engineering advantages of fully crowned teeth in gear type flexible couplings. 59

HARDNESS CONVERSION TABLES FOR STEELS —International Nickel Co., Inc., New York, N. Y. Wallet-size celluloid card containing hardness conversion tables for steels. 60

LUBRICANTS — Acheson Colloids Co., Port Huron, Mich. Bulletin 423, containing information on colloidal graphite as a high-temperature lubricant. 61

GAGES—Standard Thread Gage Co., Detroit, Mich. Leaflet giving useful data on thread plug and thread ring gages made by the company. 62

WIRE MESH CONVEYOR BELTS — Cambridge Wire Cloth Co., Cambridge, Md. 140-page catalogue giving data on the uses for wire mesh conveyor belts. 63

INDUSTRIAL FILTERS — Industrial Filtration Co., Lebanon, Ind. Bulletin on Delpark Industrial filters and quenching oil applications. 64

COLLETS — Sutton Tool Co., Sturgis, Mich. Catalogue 18, illustrating and describing the company's complete line of collets. 65

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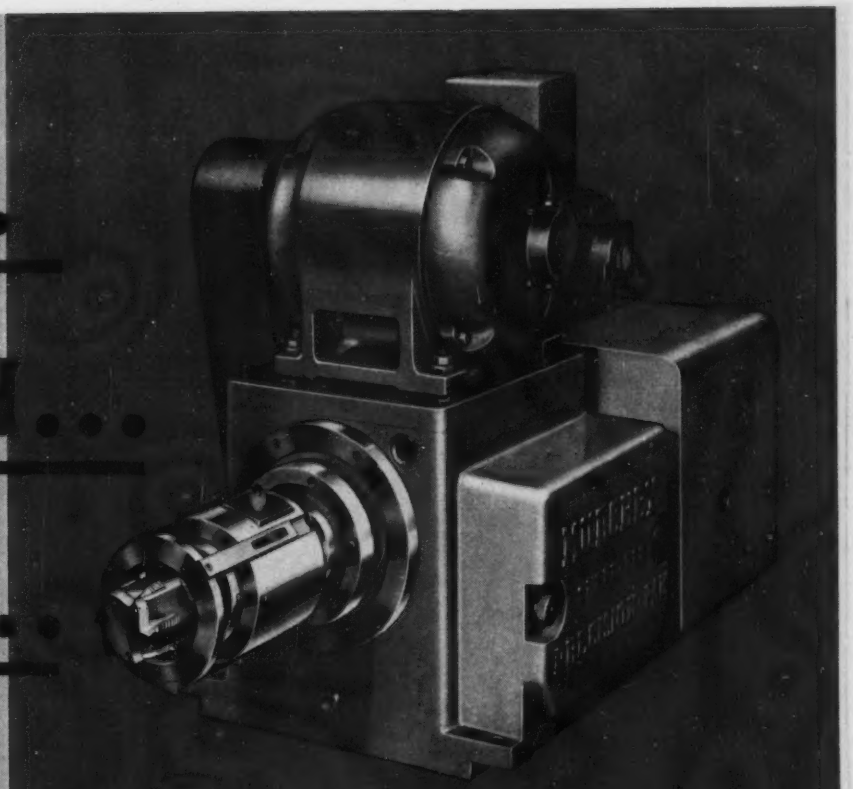

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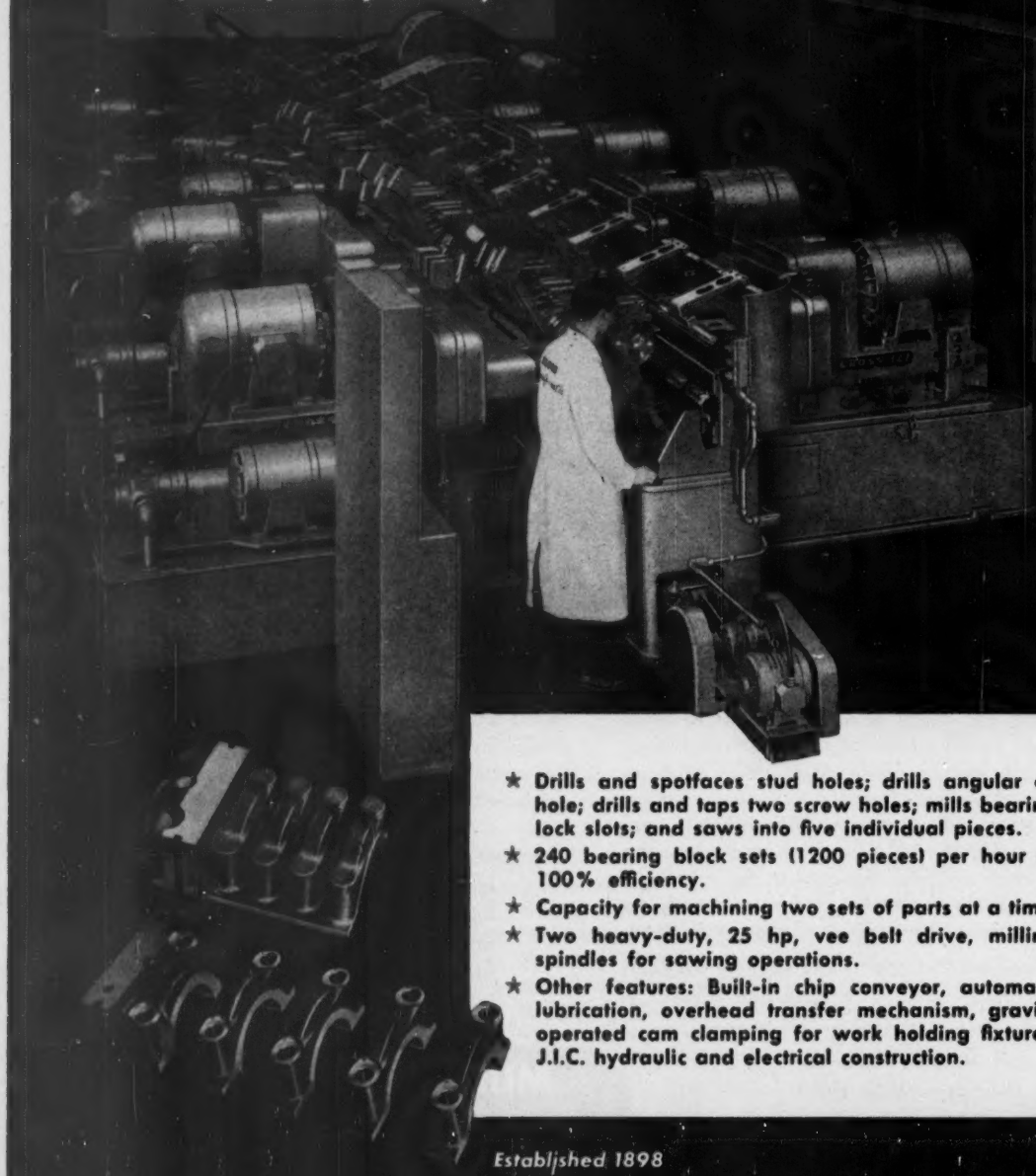

- ★ Drills and spotfaces stud holes; drills angular oil hole; drills and taps two screw holes; mills bearing lock slots; and saws into five individual pieces.
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Between Grinds

By E. S. Sallchs

Rank Rebel

Report has it that the Scribes Restaurant in New York City—where men engaged in industrial publishing hang on the feed bag—has a sign at the bar relative to the Gibson (the Martini that went to college) reading "The onions in our Gibsons will kill any chlorophyll."

"Lathes and Diamonds"

A midwestern newspaper editorial under this title used the Nizam of Hyderabad, reputedly the world's richest man, as an example of the difference between America and other nations whose wealth might be centered in jewels or in temples, for example. The point was summarized thus: "America has preferred lathes and milling machines to diamonds and emeralds. . . . Of course, we have diamonds and mink coats. But not by the shovelful. Here, mama gets a new diamond only after the lathe or stamp mill is finished, not before." Firmest statement ever uttered?

Making Merry with Steel

"A Report of Rolling Experiences" received first prize in a competition sponsored by the Association of Iron and Steel Engineers. Not a personal account, the author showed how the roll designer solves operating problems in the steel mill.

Talk About Torque

To acquaint the layman with torque and its effect on both driving and driven equipment, the Twin Disc Clutch Co. of Racine, Wis., devoted an issue of its house organ *Production Road* to this project. Now Grandma, who used to pull up the well bucket, will understand why it was easier on her biceps when the bucket was down (for the radius of the wound rope was less) and why she (acting as the engine or motor) found the crank harder to turn as the layers of rope built up.

The Destiny of the Cow — for Seating or Eating

General Motors uses plenty of cowhides in upholstering automobiles and so is interested in the subject. Leather men say that for upholstery purposes a scrub range cow may produce just as choice a hide as the finest Hereford. Over a steak dinner, however, they are agreed that there is a distinction.

A burglar on the West Coast has been removing floor safes from shops by drilling holes in the concrete around the base of the safe. So the Carboloy Department of the General Electric Co. has been informed by a man whose safe had been lifted in this manner. Now the Department does not make the Live-Spiral masonry drill for the purpose this enterprising thief put it to, and to thwart such derring-do suggests that metal reinforcing bars be placed in the concrete.

Ice Pack

Years ago Swiss metal-workers hauled heat-treated steel to the top of the Alps and left it there to age. Today there are alternatives, the *Monsanto Magazine* reminds us—such as the Sub-Zero industrial chilling machine which will, it is said, squeeze seven years of Alpine weather into four hours of man-made weather.

A Line on Wash

A compositor coming upon the name *Westinghouse News* in this number of MACHINERY set the name Washinghouse — undoubtedly under the influence of some domestic breakfast chatter centering on the advantages of doing the family laundry in an automatic machine.

Powder for Power

The ancient Chinese who invented gunpowder might have opened wide their honorable almond eyes at its latest use. Explosions of gunpowder now drive tools that fasten wood, metal, and composition to concrete and steel. These Drive-It tools are powered by .22 and .38 caliber blanks.

Horizontal Lightning

If in the dark you see a long streak of light whiz through the countryside—it's a string of new ACF freight cars whose sides have been given a striping of phosphorescent paint.

News OF THE INDUSTRY

California

LINDBERG ENGINEERING CO., Chicago, Ill., is opening a West Coast plant at 11937 S. Regentview Ave., Downey, Calif. The factory occupies an area of 12,000 square feet, and will be used to manufacture heat-treating furnaces.

PAUL D. CORNELIUS has been appointed head of the design and research department of Vlier Engineering, Inc., Los Angeles, Calif., maker of machine tool specialties.

Connecticut

BULLARD CO., Bridgeport, Conn., has opened six new field sales offices, three districts—Chicago, Ill., Detroit, Mich., and Boston, Mass.—being located at 6645 W. North Ave., Oak Park, Ill.; 2216½ N. Meridian St., Indianapolis, Ind., and 336 Washington St., Wellesley Hills, Mass., respectively. In charge of the Chicago district are CLIFFORD H. HAGBERG and JAMES L. SHAY; in charge of the Detroit district, is LAWRENCE J. BERGLUND; and of the Boston district, CHARLES E. ALLING. The remaining three field sales offices with the men in charge are as follows: EDWARD C. ROY, 5625 W. Wells St., Milwaukee, Wis.; HENRY J. MALIN, 2322 Third Ave., Rock Island, Ill.; and DAVID C. BERGLUND, 436 N. Michigan St., South Bend, Ind.

HARRY E. BEANE has been appointed vice-president of sales of the Bristol Co., Waterbury, Conn., manufacturer of automatic controlling, recording, telemetering, and aircraft instruments and socket screw products. Mr. Beane joined the Bristol sales engineering organization in 1920, and five years later was made district manager of the Birmingham, Ala., office. In 1943, he became sales manager of the Instrument Division, and later was promoted to the position of general sales manager.

Illinois

OTTO SCHMIDT was recently appointed midwestern drill unit sales representative for the Delta Power Tool Division, Rockwell Mfg. Co., Pittsburgh, Pa. Mr. Schmidt, with Delta Power Tool since 1928, will make his headquarters at 817 Forest Road, La Grange Park, Ill.

JACK W. HARVEY, formerly assistant sales manager in charge of the Chicago territory for Manco Mfg. Co., Bradley, Ill., has been promoted to the position of sales manager. Mr. Harvey will be in charge of the company's activities in the hydraulic tool field.

VICTOR BROWN has been named a vice-president of the Kropp Forge Co., Chicago, Ill. Mr. Brown, who was formerly assistant to the president, joined the company in 1942.

H. BRUCE RASMUSSEN has been named sales manager by the Miller Motor Co., Melrose Park, Ill., and will be in charge of the company's coast-to-coast sales organization.

MAGNAFLUX CORPORATION, manufacturer of non-destructive testing equipment, has recently moved from 5900 N. Northwest Highway to 7300 W. Lawrence Ave., Chicago 31, Ill.

INDEPENDENT PNEUMATIC TOOL CO., Aurora, Ill., announces the change of its corporate name to THOR POWER TOOL CO.

Michigan

MICHIGAN TOOL CO., Detroit, Mich., has announced the formation of a separate division to manufacture and market a line of industrial chemical products which has been under development for several years. The new division will be known as the Shear-Speed Chemical Products Division, with headquarters at 7125 E. McNichols Road, Detroit 12. LARRY A. BARD has been named manager.

Harry E. Beane, new vice-president of sales of the Bristol Co.

JOHN P. SWEENEY has been made district manager of the Detroit, Mich., branch of Firth Sterling, Inc., Pittsburgh, Pa., while MUNRO J. MANN has become assistant district manager. Mr. Sweeney succeeds GUNTHER A. JACOBS who, after forty-eight years of service with the company, is retiring from the position of Detroit district manager but continuing as vice-president of Firth Sterling.

WILSON MECHANICAL INSTRUMENT DIVISION, AMERICAN CHAIN & CABLE CO., INC., Bridgeport, Conn., recently opened a service shop at 20455 Sherwood, Detroit 34, Mich., with complete facilities for servicing Rockwell and Tukon hardness testers.

ROMULUS TOOL & ENGINEERING, 36051 Goddard, Romulus, Mich., is a company that has recently been formed to build jigs, fixtures, controls, and special machinery. The new company will be operated by JOSEPH PLAYER as president and EDWARD HALIK.

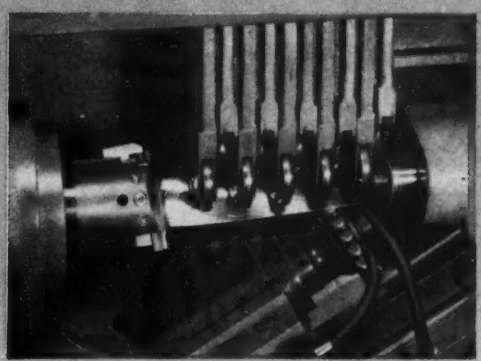
DETROIT STAMPING CO., Detroit, Mich., announces the opening of an assembly plant at Birmingham, Mich., which will be devoted to the manufacture and packaging of its line of toggle clamps.

A. M. SARGENT, former president of the Pioneer Engineering & Mfg. Co., Detroit, Mich., has opened his own consulting engineering office at 10120 W. McNichols Road, Detroit 21, Mich.

S. GORDON SAUNDERS, who was formerly with the Chrysler Corporation, has joined the Bay State Abrasive Products Co., Westboro, Mass., being appointed Detroit, Mich., district manager.

HENRY F. ARNDT has been named chief engineer of the Detroit Electric Furnace Division, Kuhlman Electric Co., Bay City, Mich., replacing CHARLES V. KILBURN, who resigned.

WILLIAM H. ROBERTS was recently elected vice-president and secretary of the Detroit Stamping Co., Detroit, Mich., succeeding JOHN BECK and



Close-up of a jet aircraft blade and Continental cutter on Ex-Cell-O Style 86 Precision Profile Miller.

These carbide tipped milling cutters are designed to take heavier cuts in stainless steel. This feature reduces glazing or work-hardening commonly experienced with conventional cutters. They're manufactured by Continental and used on profile millers for jet aircraft blades. If you are machining jet blades, or have any other job on which "performance-proved" tools can be used, get in touch with Continental or call in your local Ex-Cell-O representative.

Continental
TOOL WORKS

DIVISION OF EX-CELL-O CORPORATION

DETROIT 32, MICHIGAN

52-11

H. G. ROBERTS, who have been serving as these respective officers in a semi-active capacity in recent years. Mr. Roberts has been with the company for fifteen years.

ROYAL OAK TOOL & MACHINE CO., Royal Oak, Mich., announces the opening of a new plant there at 29800 Stephenson Highway.

New York and New Jersey

GENERAL ELECTRIC CO., Schenectady, N. Y., announces various appointments in the three newly established departments of the Motor and Generator Division. In the Medium Induction Motor Department, the following men were named section managers — GEORGE I. CLOVER, manager of manufacturing; CHARLES J. KOCH, manager of engineering; and JOE T. FARRELL, manager of marketing—and DWIGHT E. MOORHEAD was made manager of the San Jose, Calif., plant. In the Marketing Department, EDWARD A. GREEN was made manager of a product planning practices section. In the Synchronous and Specialty Motor and Generator Department, located at the Lynn, Mass., River Works, these men were appointed section managers: BASCOM H. CALDWELL, manager of engineering; JAMES M. SULLIVAN, manager of manufacturing; and DAVID A. YATES, manager of marketing.

HERBERT P. DALES has been appointed sales manager and CARL L. ADELMAN, assistant sales manager of the Coated Products Division of the Carborundum Company, Niagara Falls, N. Y. The Division is located at Wheatfield, N. Y. The company also announced the following personnel changes in three district sales offices: RUSSELL P. COLOSI, formerly office manager at Cleveland, Ohio, has been appointed assistant to the Cleveland district sales manager; CHARLES J. WALTER, who was office manager of the Los Angeles, Calif., district, has assumed the position vacated by Mr. Colosi; WILFRED ROBSON, assistant office manager of the Chicago, Ill., district, has been transferred to Los Angeles, filling the position vacated by Mr. Walter; and JOSEPH A. MARRONE has assumed Mr. Robson's former post.

RIVETT LATHE & GRINDER, INC., Boston, Mass., recently appointed the LANE ENGINEERING CO., 1807 Elmwood Ave., Buffalo, N. Y., as representative in the Buffalo area for the Rivett line of air and hydraulic valves and cylinders, and power units. CLIFFORD J. LANE, who is head of the Lane Engineering Co., has had twenty-three years' experience in designing, engineering, and selling air and hydraulic circuits and components. Also anounced was the appointment of GENESEE MACHINE BUILDERS, INC., 1732 Hudson Ave., Rochester, N. Y., as representative in the Rochester area. MERLE HANFORD is head of the Air and Hydraulic Sales Division for the Genesee concern.

A. C. BROWN, JR., Pittsburgh, Pa., regional manager of the Air Reduction Sales Co., New York City, has been named general sales manager, and will now have his headquarters in New York City. Mr. Brown has been with Air Reduction since 1935. J. H. KEENEY, administrative assistant in Pittsburgh, succeeds Mr. Brown as regional manager, while J. H. HART, who was district manager in Detroit, Mich., takes Mr. Keeney's place. R. A. JAMIESON, who was assistant sales manager in Detroit, has been promoted to the post vacated by Mr. Hart.

ENGINEERING RESEARCH ASSOCIATES, St. Paul, Minn., manufacturers of electronic computer equipment, having been acquired last year as a subsidiary of Remington Rand Inc., New York City, has now become a division of that company and will be known as the Engineering Research Associates Division. John E. Parker, formerly president of the St. Paul concern, has been appointed a vice-president of Remington Rand, with headquarters in New York City.

H. & B. AMERICAN MACHINE CO., Chicago, Ill., announces the purchase of the KARP METAL PRODUCTS CO., INC., of Brooklyn, N. Y., manufacturer of specially fabricated sheet-metal products. The latter company will continue to operate as a division of the H. & B. American Machine Co.

WESTCOTT CHUCK CO., Oneida, N. Y., announces the purchase of the stock of STANDARD "improved" two-jawed drill chucks and repair parts from the STANDARD TOOL CO., Cleveland, Ohio.

IRWIN COLMAN has been appointed assistant sales manager in charge of hydraulic components by Greer Hydraulics, Inc., Brooklyn, N. Y.

ADAMAS CARBIDE CORPORATION, Harrison, N. J., manufacturer of tungsten-carbide tool tips, dies, and wear parts, has appointed CLYDE SMITH sales representative in southern Ohio. Mr. Smith is located at 371 N. Olive St., Elyria, Ohio. Another representative of the corporation, the QUINT-ALLOY CORPORATION, Dearborn, Mich., recently celebrated an open house to mark the establishment of the Adamas Carbide Corporation's Detroit stock.

A. F. WIEST has been placed in charge of all manufacturing operations for the Alloy Tube Division, Union, N. J., of the Carpenter Steel Co., Reading, Pa. Mr. Wiest, who has been with the Division since 1929, succeeds JOHN A. DIETRICH, the latter having recently resigned.

EDWARD N. RYAN, sales engineer in the New York branch office, Harrison, N. J., of the Crucible Steel Company of America, New York City, has been promoted to the positoin of assistant manager of the office at Harrison.

Ohio

COLONEL WILLIAM J. DARMODY (U. S. Army, Ret.), a widely known ordnance gage expert, has joined the Sheffield Corporation, Dayton, Ohio,

Colonel William J. Darmody, who has become a consultant to the Sheffield Corporation

as a part-time consultant. Before retiring from active service, Colonel Darmody spent eight years as chief of the gage department at Frankford Arsenal, and was responsible for Army Ordnance gage laboratories, gage design, and supply on a national basis. He will make his headquarters in Washington, D. C., but will spend part of his time at the main Sheffield plant in Dayton.

U. S. Drill Head Co., Cincinnati, Ohio, as a result of change in ownership, announces the election of the following officers: Chairman of the board, W. C. MOENING, formerly a partner; president, A. P. SPECKIN, formerly general manager; and J. R. BASHOR, vice-president.

HENRY KARR, purchasing agent of the Cleveland Crane & Engineering Co., Wickliffe, Ohio, has retired after over fifty years of service with the company. His position will be filled by GEORGE W. URBAN, who was assistant purchasing agent.

(This section continued on page 255)

AUTOMATIC SUBMERGED

Arc Welding Machine

for TORQUE CONVERTER

Builders of SPECIAL MACHINES for EVERY PURPOSE

FOR FURTHER INFORMATION CONTACT

EXPERT WELDING MACHINE CO.

17144 MT. ELLIOTT AVE. • DETROIT 12, MICH. • PHONE TWINBROOK 1-4327

Safest, Straightest-Cutting, Most Durable Blade Ever Made

Starrett

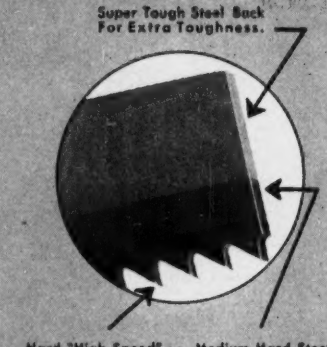
SAFE-FLEX HIGH SPEED WELDED EDGE POWER HACKSAW BLADES

IT'S SHATTERPROOF!

Double welding makes Starrett SAFE-FLEX Power Hacksaw Blades the safest, straightest cutting, long-lasting blade ever made. Use it with complete safety for your toughest cutting jobs — for multiple sawing work or interrupted cuts. Use it with greater economy for *all* your power cutting. Step up the speed and feed. Watch it cut clean and fast with no danger of shattering.

Double welded construction, an entirely new development in hacksaw design, gives Starrett SAFE-FLEX blades the perfect combination of hardness and toughness. The cutting edge of hard, high speed steel is reinforced with a medium hard, extra strong center and backed up with a super-tough steel back. See what the new Starrett SAFE-FLEX blade can mean to you in more and straighter cuts per blade. Order a supply today.

Here's what DOUBLE-WELDED SHATTERPROOF CONSTRUCTION MEANS


Super Tough Steel Back For Extra Toughness.
Hard "High Speed" Edge For High Production — No Tooth Stripping.
Medium-Hard Steel Center For Extra Strength.

STARRETT TOOLS

TRADE MARK Starrett REG U.S PAT OFF

SINCE 1880
WORLD'S GREATEST TOOLMAKERS

THE L. S. STARRETT COMPANY
Athol, Massachusetts, U. S. A.

MECHANICS' HAND MEASURING TOOLS AND PRECISION INSTRUMENTS
DIAL INDICATORS • STEEL TAPES • PRECISION GROUND FLAT STOCK
HACKSAWS, BAND SAWS and BAND KNIVES

Buy THROUGH YOUR INDUSTRIAL DISTRIBUTOR

Prompt delivery
Dependable service
Quality products

USEFUL DRILLING INFORMATION—1

Drill Size Number	Drill Size Inch	Drill Diameter, Inch	Tolerance,* Inch Minus	Tolerance,* Inch Plus	Area of Drilled Hole, Square Inch	Speed, in Revolutions per Minute, Necessary for Cutting Speed of 100 Feet per Minute
80		0.0135	0.0005	0.0023	0.000143	28,300
79		0.0145		0.0024	0.000165	26,340
	1/64	0.0156		0.0025	0.000191	24,440
78		0.0160		0.0025	0.000201	23,870
77		0.0180		0.0026	0.000254	21,220
76		0.0200		0.0027	0.000314	19,100
75		0.0210		0.0027	0.000346	18,190
74		0.0225		0.0028	0.000398	17,020
73		0.0240		0.0028	0.000452	15,920
72		0.0250		0.0029	0.000491	15,280
71		0.0260		0.0029	0.000531	14,730
70		0.0280		0.0030	0.000616	13,640
69		0.0292		0.0030	0.000670	13,060
68		0.0310		0.0031	0.000755	12,320
	1/32	0.0312		0.0031	0.000767	12,220
67		0.0320		0.0031	0.000804	11,940
66		0.0330		0.0032	0.000855	11,580
65		0.0350		0.0032	0.000962	10,910
64		0.0360		0.0033	0.001018	10,610
63		0.0370		0.0033	0.001075	10,320
62		0.0380		0.0033	0.00113	10,050
61		0.0390		0.0033	0.00119	9794
60		0.0400		0.0034	0.00126	9549
59		0.0410	0.0010	0.0034	0.00132	9316
58		0.0420		0.0034	0.00138	9095
57		0.0430		0.0035	0.00145	8903
56		0.0465		0.0035	0.00170	8215
	3/64	0.0469		0.0036	0.00173	8033
55		0.0520		0.0037	0.00212	7346
54		0.0550		0.0038	0.00238	6945
53		0.0595		0.0039	0.00278	6414
	1/16	0.0625		0.0039	0.00307	6111
52		0.0635		0.0039	0.00317	6015
51		0.0670		0.0040	0.00353	5701
50		0.0700		0.0041	0.00385	5457
49		0.0730		0.0041	0.00418	5233
48		0.0760		0.0042	0.00454	5026
	5/64	0.0781		0.0042	0.00479	4889
47		0.0785		0.0042	0.00484	4866
46		0.0810		0.0043	0.00515	4716
45		0.0820		0.0043	0.00528	4658

*Tolerances for drilled holes which can be maintained under usual shop conditions.

MACHINERY'S Data Sheet No. 727, April, 1953

Compiled by Whitman & Barnes, Plymouth, Mich.

USEFUL DRILLING INFORMATION—2

Drill Size Number	Drill Size Inch	Drill Diameter, Inch	Tolerance,* Inch Minus	Tolerance,* Inch Plus	Area of Drilled Hole, Square Inch	Speed, in Revolutions per Minute, Necessary for Cutting Speed of 100 Feet per Minute
44		0.0860	0.0010	0.0044	0.00580	4442
43		0.0890		0.0044	0.00622	4292
42		0.0935		0.0045	0.00686	4085
	3/32	0.0937		0.0045	0.00689	4017
41		0.0960		0.0045	0.00724	3979
40		0.0980		0.0046	0.00754	3898
39		0.0995		0.0046	0.00777	3839
38		0.1015		0.0046	0.00809	3763
37		0.1040		0.0047	0.00849	3673
36		0.1065		0.0047	0.00890	3587
	7/64	0.1094		0.0047	0.00939	3492
35		0.1100		0.0047	0.00950	3472
34		0.1110		0.0048	0.00968	3442
33		0.1130		0.0048	0.0100	3380
32		0.1160		0.0048	0.0106	3293
31		0.1200		0.0049	0.0113	3183
	1/8	0.1250		0.0050	0.0123	3056
30		0.1285		0.0050	0.0129	2973
29		0.1360		0.0051	0.0145	2809
28		0.1405		0.0052	0.0155	2719
	9/64	0.1406		0.0052	0.0155	2719
27		0.1440		0.0052	0.0163	2653
26		0.1470		0.0052	0.0170	2598
25		0.1495		0.0053	0.0175	2555
24		0.1520		0.0053	0.0181	2513
23		0.1540		0.0053	0.0186	2480
	5/32	0.1562		0.0053	0.01915	2445
22		0.1570		0.0053	0.0194	2433
21		0.1590		0.0054	0.0199	2402
20		0.1610		0.0054	0.0204	2372
19		0.1660		0.0055	0.0216	2301
18		0.1695		0.0055	0.02256	2260
	11/64	0.1719		0.0055	0.0232	2220
17		0.1730		0.0055	0.0235	2208
16		0.1770		0.0056	0.0246	2158
15		0.1800		0.0056	0.0254	2127
14		0.1820		0.0057	0.0260	2099
13		0.1850		0.0057	0.0269	2065
	3/16	0.1875		0.0057	0.0276	2037
12		0.1890		0.0057	0.0280	2021
11		0.1910		0.0057	0.0286	2000
10		0.1935		0.0058	0.0294	1974

*Tolerances for drilled holes which can be maintained under usual shop conditions.

MACHINERY'S Data Sheet No. 728, April, 1953

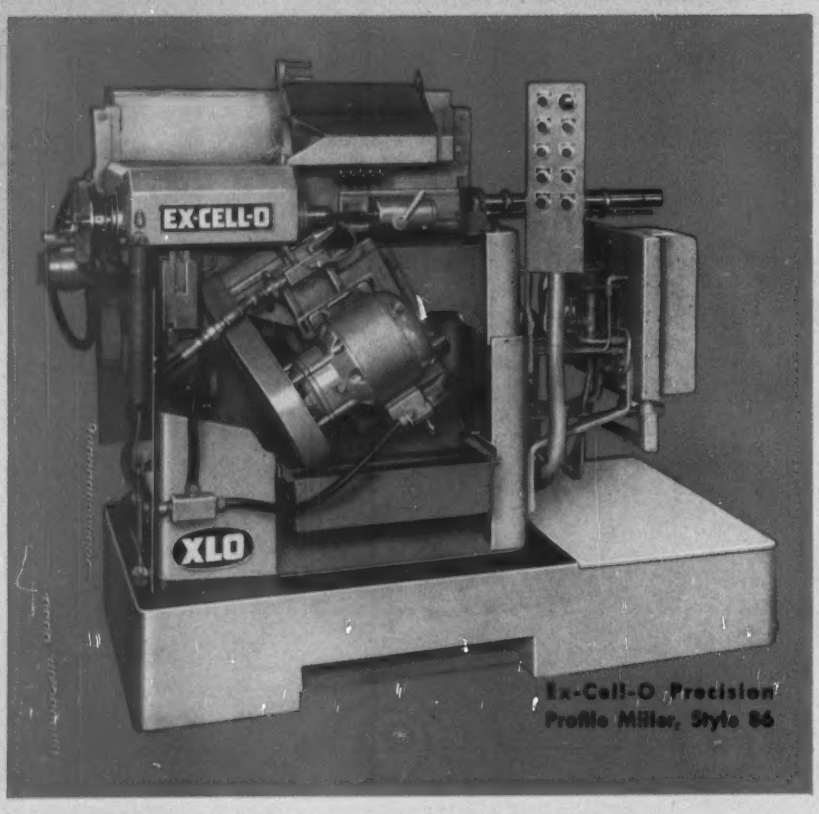
Compiled by Whitman & Barnes, Plymouth, Mich.

FOR PRECISION IN VOLUME JET BLADE PRODUCTION . . .

Typical jet blade, the airfoil form of which is efficiently and accurately milled on the Ex-Cell-O Profile Miller.

Ex-Cell-O

Machine Mills Airfoil Automatically



Ex-Cell-O Precision Profile Miller, Style 86

The Ex-Cell-O Style 86 Precision Profile Miller is designed expressly for milling compressor blades and similar parts. It is hydraulically operated, and fully automatic except for loading and unloading.

It mills the complete airfoil form, including leading and trailing edges, working from an accurate cam made from the engineer's master glass layouts. The work, rigidly supported by roller type back rests, travels lengthwise across the cutter, and is indexed after each stroke. An index plate determines the number and spacing of indexes.

If you would like to obtain *precision in volume jet blade production,* get the complete "Ex-Cell-O Package" of blade finishing equipment. For details write, wire, or phone Ex-Cell-O in Detroit or contact your local Ex-Cell-O representative today.

XLO

EX-CELL-O CORPORATION DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS
DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

52-22

Gordon M. Sommers, chief engineer of the Hamilton Division of the Clearing Machine Corporation

GORDON M. SOMMERS was recently appointed chief engineer in the Hamilton, Ohio, plant of the Clearing Machine Corporation, Chicago, Ill., manufacturer of power presses. Mr. Sommers will be responsible for the design of all presses and auxiliary equipment at the Hamilton Division.

ZAGAR TOOL, INC., Cleveland, Ohio, manufacturer of multi-spindle drill heads, special drilling machinery, broaching equipment, and collet production tools, has expanded its plant so that the capacity is doubled and space for sales and engineering divions increased by a total of 2000 square feet.

RICHARD K. MCCONKEY has been named assistant general manager of the Industrial Division at the Timken Roller Bearing Co., Canton, Ohio, succeeding the late Melvin H. Kuhl. Mr. McConkey was formerly district manager of the Industrial Division at the Moline, Ill., office.

HARRY L. JENTER, assistant district manager of operations for the Cleveland district of the American Steel & Wire Division, United States Steel Corporation, Cleveland, Ohio, has been promoted to the position of district manager of operations. Mr. Jenter succeeds ALBERT J. HOYT, who has retired.

RUSSEL L. GERGEN has been made sales manager of the Gage Division by the Pipe Machinery Co., Cleveland, Ohio. Mr. Gergen has been with the company for twelve years in various capacities, including that of chief engineer.

G. A. GRAY CO., Cincinnati, Ohio, manufacturer of milling, planing, and boring machines, announces an expansion program which will include the construction of two buildings, together with important plant modifications.

WARNER & SWASEY CO., Cleveland, Ohio, builder of machine tools and precision instruments, has begun operations at its recently completed plant in New Philadelphia, Ohio. The plant has 137,000 square feet of manufacturing floor space, and provides facilities for making parts and minor assemblies which will be shipped to the company's main plant in Cleveland for subsequent assembly into complete machines.

TIMKEN ROLLER BEARING CO., Canton, Ohio, has announced a multi-million-dollar expansion program for the Bucyrus, Ohio, plant. The cost of the new manufacturing equipment for this project will be approximately $2,000,000.

ROY O. JOHNSON has joined the Hydraulic Press Mfg. Co., Mount Gilead, Ohio, in the capacity of metallurgist, while CHARLES W. EASTMAN has become associated with the company as industrial engineer.

RUSSEL J. KELLER has joined the Cleveland Welding Co., Cleveland, Ohio, subsidiary of the American Machine & Foundry Co., New York City, as engineering assistant to the president.

CHESTER H. KIMMEL has been appointed vice-president and general manager of the Ohio Crankshaft Co., Cleveland, Ohio. Mr. Kimmel joined the company in 1940 as factory manager of the Crankshaft and Camshaft Division. Six years later, he was made general manager of this Division, and last year was elected a vice-president.

Chester H. Kimmel, newly appointed vice-president and general manager of Ohio Crankshaft Co.

Pennsylvania

WESTINGHOUSE ELECTRIC CORPORATION, Pittsburgh, Pa., has announced a reorganization of the Headquarters Manufacturing Division. Executive appointments made are as follows: C. G. WALLIS, former manager of the headquarters manufacturing department, assistant to the vice-president; L. S. HOUK, director of works engineering; N. H. KING and R. I. WILSON, director and assistant director, respectively, of production and inventory control; G. C. MOORE, director of plant industrial engineering; and JOSEPH MANUELE, director of quality control. As part of the reorganization, a new department has been created, to be known as the manufacturing and equipment engineering department with the following personnel: EDWARD GRIFFITHS, director of expense control; W. H. DICKINSON, director of manufacturing engineering; and G. P. LONGABAUGH, equipment engineer.

KENNAMETAL, INC., Latrobe, Pa., announces the following appointments: RICHARD H. OBERHOLTZER has been made manager of the Milwaukee district with headquarters at 744 N. Fourth St., Milwaukee, Wis., succeeding CARL WHEELOCK, who is resigning; LEONARD ARNOLD and JAMES DENIAL have become representatives in Syracuse and Elmira, N. Y., respectively; ANDREW HORVATH, has been appointed service representative, and ROBERT SCHWING, service engineer, in the Middle Atlantic district; KENNETH HOFFMAN and CARL E. WIDEN have been named service engineers in the Chicago, Ill., area; and GEORGE R. SUNDELL has been made service engineer in the Pittsburgh, Pa., area.

E. G. MOFFAT has been appointed manager of the Carbide Sales Division for Firth Sterling, Inc., Pittsburgh, Pa., succeeding C. R. HARMON, who has resigned. KENNETH F. JULIN has been made assistant manager in this Division, occupying the post vacated by J. MARTIN STOKES who was promoted to the position of assistant general sales manager—administration. Also announced was the appointment of FRED LORD as chief engineer in the Mining Sales Division. Mr. Lord has been with the company for the last twelve years in various capacities, most recently holding the post of assistant chief production engineer.

JAMES O. CLEVENGER, manager of the Buffalo, N. Y., welding department for the Westinghouse Electric Corporation, Pittsburgh, Pa., has been made sales manager of general industrial products. In his new capacity, Mr. Clevenger will be located at the headquarters in Pittsburgh. Also announced was the appointment of J. P. COUGHLIN as manager of the arc

welding department. Mr. Coughlin has been with the corporation since 1939, and at the time of his promotion was manager of field sales for the welding department in East Pittsburgh.

KENNAMETAL, INC., Latrobe, Pa., announces the appointment of the following export representatives: For Japan, L. D. SEYMOUR & Co., 120 Wall St., New York City; for Indonesia, KOOPMAN & Co., N.V., Stadhouderskade 6, Amsterdam, The Netherlands; for Belgian Congo, MATERIELS & MATERIAUX DE CONSTRUCTIONS, S.A., 1-2, Route De L'Etoile, Elisabethville; and for Northern Mexico, CIA. MEXICANA DE ELECTRICIDAD, S.A., Zaragoza Nte. 652, Monterrey, N.L.

E. W. RISTAU has been made vice-president in charge of sales of the Power Tool Division, Rockwell Mfg. Co., Pittsburgh, Pa. Mr. Ristau was director of sales and advertising for the Division at the time of his appointment. The operation of this Division has just been placed under the jurisdiction of L. A. DIXON, Rockwell executive vice-president.

JOHN STOLARZ, formerly general sales manager of the Delta Power Tool Division of the Rockwell Mfg. Co., Milwaukee, Wis., has joined DeWalt, Inc., Lancaster, Pa., a subsidiary of the American Machine & Foundry Co., New York City. Mr. Stolarz will be industrial sales manager. Also announced was the appointment of Thomas E. Berry as district manager to cover the New York territory for DeWalt.

UNITED STATES STEEL CORPORATION, New York City, is constructing an entirely new research center for the corporation's expanding research program in developing better steels and steel technology. The center will be located in a rural area of Allegheny County, Pittsburgh, Pa., and will consist of three buildings with a total floor area of 132,000 square feet.

UNIFORM TUBES, Collegeville, Pa., manufacturer of seamless tubing, has announced its incorporation. Officers are as follows: President and chairman of the board, ALBERT H. MAINWARING; secretary, DAVID T. MACNAIR; and treasurer, A. BRUCE MAINWARING.

AIR REDUCTION SALES CO., New York City, recently opened its liquid oxygen plant in Butler, Pa., and commenced delivery of oxygen to industrial customers. The plant is located at Bantam Ave.

ALBERT H. CLEM has been appointed general sales manager of the Pennsylvania Salt Mfg. Co., Philadelphia, Pa., filling the position left vacant by the recent death of Russell S. Roeller. Mr. Clem was assistant general sales manager.

THOMAS A. DOWNIE, Erie, Pa., has been appointed sales engineer in northern Pennsylvania for the Wm. K. Stamets Co., Pittsburgh, Pa., manufacturer of machine tools and special machinery.

DAVID A. COULTER has joined Brenholts, Goin & Ogg, Inc., Pittsburgh, Pa., management consultants, in the capacity of vice-president.

ARMAND A. PROBECK has joined Snap-Tite, Inc., Union City, Pa., in the capacity of vice-president.

South Atlantic States

CARL L. IPSEN has retired from the General Electric Co., Schenectady, N. Y., after an association of thirty-nine years with the company. From 1947 until 1951, he served as manager of the Industrial Heating Department and during the past year acted as chief consultant for the Department. Mr. Ipsen is now taking the post of executive vice-president of the Industrial Furnace Manufacturers Association in Washington, D. C.

SAMUEL A. MCKEE, chief of the Lubrication Section of the National Bureau of Standards, Washington, D. C., retired recently after thirty-two years of service with the Bureau.

BLACK & DECKER MFG. CO., Towson, Md., manufacturer of portable electric tools, announces an addition to its Hampstead, Md., plant, which will more than double the present size.

WILLIAM C. DAVIDSON has been appointed abrasive engineer for the West Virginia territory by the Norton Co., Worcester, Mass. Mr. Davidson has been with the firm since 1945.

WESTINGHOUSE ELECTRIC CORPORATION, Pittsburgh, Pa., recently established a branch office at Atlanta, Ga. THOMAS FULLER, JR., was appointed branch manager; GEORGE W. MILLER, distribution apparatus manager; T. J. WOTH, engineering manager; and G. W. ALEXANDER, service manager. Mr. Fuller was formerly manager of the Chattanooga, Tenn., office, and the post he vacated will be filled by J. J. HILL. Another office was established at Greenville, S. C., with J. H. REEVES as manager. Also announced was the appointment of E. P. ATHENS as manager of the Jacksonville, Fla., office.

Wisconsin and Minnesota

WERNER I. SENGER was recently appointed to the newly created position of vice-president in charge of balancing by the Gisholt Machine Co., Madison, Wis. Mr. Senger has been with the company for over thirty-five years, and has been in charge of balancing machine development and engineering since 1924. He is a recognized authority on balancing and the author of a number of treatises on this subject.

Werner I. Senger, vice-president in charge of balancing for the Gisholt Machine Co.

JOSEPH T. RYERSON & SON, INC., Chicago, Ill., has announced that a new steel service plant is being constructed in Milwaukee, Wis., which will triple the capacity of the present Milwaukee plant. The new plant will have approximately 166,000 square feet of floor space, and will be situated at S. 84th St. and the Milwaukee Railroad.

HORTON CHUCK DIVISION OF THE E. HORTON & SON CO., Windsor Locks, Conn., manufacturer of lathe chucks, announces the recent appointment of PRICE DAVIS as representative in Wisconsin. Mr. Davis has his headquarters in Milwaukee, where he operates his own business as a manufacturers' agent.

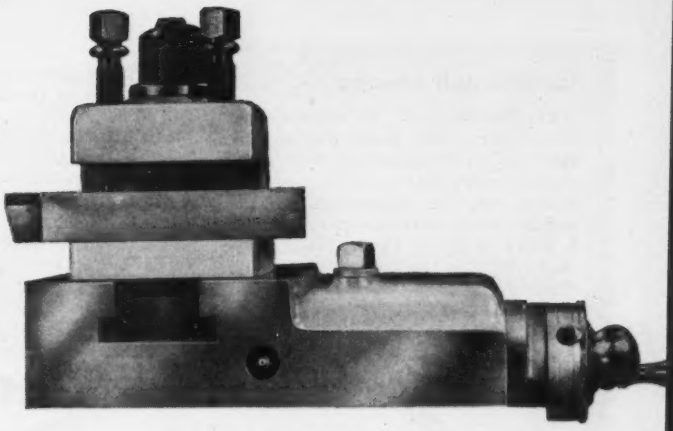
EHRET & KINSEY, Chicago, Ill., representative of the CLEVELAND WORM & GEAR CO., and the FARVAL CORPORATION, Cleveland, Ohio, recently opened an office at 2400 W. Clybourn, Milwaukee 3, Wis. JAMES A. GRAMLING will be in charge of the new office.

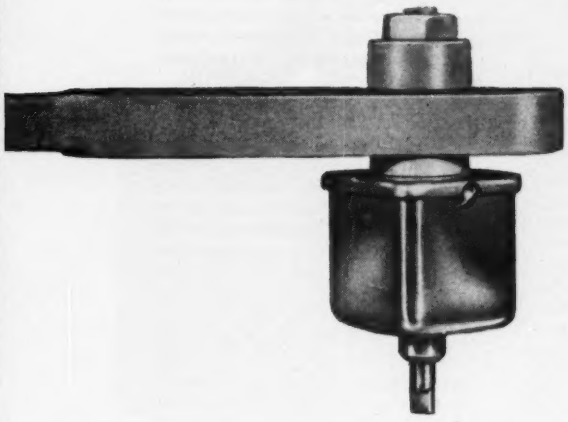
NATIONAL MACHINE TOOL CO., Racine, Wis., has announced the change of its corporate name to HEINRICH TOOLS INC.

CLEARING MACHINE CORPORATION, Chicago, Ill., manufacturer of hydraulic and mechanical presses, recently appointed the SATTERLEE CO., Minneapolis, Minn., a distributor. The distributor will handle the entire Clearing press line both in Minneapolis and northern Wisconsin.

TOOL....

All the accuracy, rigidity and sensitivity built into Monarch lathes means optimum performance here.





...WITH ITS OWN NERVOUS SYSTEM...

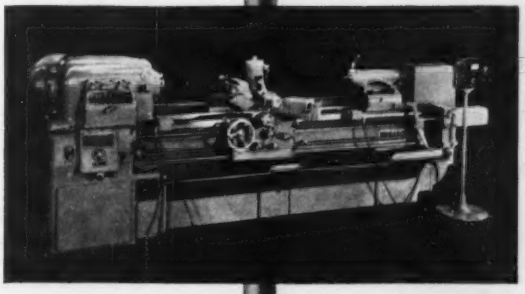
The Air-Gage Tracer is the most accurate lathe duplicating device yet developed. Change in template shape is converted to corresponding tool position change in a few thousandths of a second, tracer stylus operating on only 5 to 6 oz. pressure.

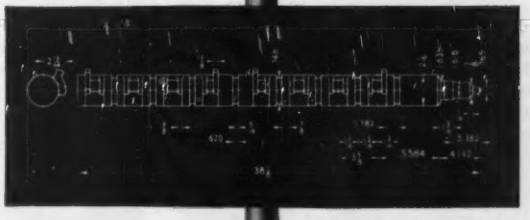
...AND BRAIN!.....

The Auto Cycle Unit is an *extra* push button control feature. Provides feed change as you need it... gives full automatic cycle operation... saves more time with fast traverse return.

Put all this together....

and you get the exclusive Monarch Air-Gage Tracer story in a nutshell. Higher output. Lower costs. Highest standards. Production at a profit. See typical job at right. Our Booklet #2606 gives many other examples, full details and specifications. Ask for it and see how tracer controls and Auto Cycle Unit can be applied to most Monarch Lathes. Write and indicate your interests... *The Monarch Machine Tool Company, Sidney, Ohio.*





FINGER LOCK BAR. *Material* — SAE 1045 forging. *Operations performed* — Turn complete. *Machine* — Series 60 Lathe with Auto Cycle Unit. *Total machining time* — 1 hour. *Time formerly required* — 4 hours.

Monarch

ACCURACY • ECONOMY • LONG LIFE

TURNING MACHINES

FOR A GOOD TURN FASTER... TURN TO MONARCH

Canada and Mexico

ALLEN-BRADLEY CO., Milwaukee, Wis., is opening a new plant with a floor space of 45,000 square feet at Galt, Ontario, Canada, to serve the Canadian market. Operations will be carried on by ALLEN-BRADLEY CANADA LIMITED, a newly incorporated associate of the Milwaukee company. KEITH H. RAPSEY, vice-president and general manager of the new firm, will be in charge of the Galt plant.

THOR POWER TOOL CO., formerly the Independent Pneumatic Tool Co., Aurora, Ill., manufacturer of portable power tools, has opened a sales office in Mexico, forming a new company for the purpose, to be known as THOR TOOLS OF MEXICO, INC., at Basilio Badillo No. 47, Mexico, D.F.

New Books and Publications

MANUAL ON CUTTING OF METALS. Prepared by the ASME Research Committee on Metal Cutting Data and Bibliography. 546 pages, 5 3/4 by 8 1/2 inches. Published by the American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y. Price, $10.

The second edition of this book on the cutting of metals with single-point tools enlarges upon the first (published in 1939) in that it incorporates a more descriptive pre entation of tool materials and their treatment; of work materials and the relations of their behavior and properties to microscopic structure; and much new material on the types, purposes, and application of cutting fluids. Specifically, there are 322 tables covering the machining of thirty-five commonly used steels by seven differently shaped tools.

The subject matter is presented in seven parts, as follows: Types, Uses, and Preparations of Single-Point Tools; Metallurgical and Mechanical Factors in Using Single-Point Tools; Cutting Fluids Used with Single-Point Tools; The Machining of Various Metals; Forces, Power, and Cutting Speeds for Specific Conditions, Turning a Variety of Metals; The Economics of Metal-Cutting; and Tabular Data on Cutting Speeds and Horsepower.

MECHANICS OF MATERIALS. By Seibert Fairman and Chester S. Cutshall. 420 pages, 6 by 9 inches, 338 illustrations. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price, $5.75.

This book attempts to make the subject of mechanics of materials meaningful to the student by applying theory to practical situations. Some features of the text are the many illustrated problems that are completely solved, the thorough treatment of the area-moment method with both statically determinate and indeterminate beams, and a complete and systematic study of stresses and columns. Included are more than 700 problems to be solved by the student. Some of these are grouped at the end of the specific articles on which they are based; others of a more general nature, are grouped at the end of the chapters.

The fourteen chapters treat the following topics: Stress and Strain; Mechanical Properties of Materials; Riveted and Welded Joints; Torsion; Shear and Moment in Beams; Stresses in Beams; Bending Combined with Direct Tension or Compression; Deflection of Beams—Double-Integration Methods; Deflection of Beams—Area-Moment Method; Statically Indeterminate Beams; Special Topics in Beams; Columns; Combined Stresses; and Strain Energy and Impact.

PROCEEDINGS OF THE FIRST U. S. NATIONAL CONGRESS OF APPLIED MECHANICS. 997 pages, 8 1/2 by 11 inches. Published by the American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y. Price, $20.

This is an up-to-date treatise on important advances made in the following branches of applied mechanics: elasticity, photoelasticity, plates and shells, creep, fatigue, buckling, dynamics, vibrations, fluid flow, thermal stresses, and aerodynamics.

Sponsored by a committee on theoretical and applied mechanics representing national engineering societies and colleges, the Congress brought together most of the recognized authorities in the field for a discussion of many of the most significant problems encountered in modern applied mechanics. Their findings are presented in 135 papers published in these Proceedings, thereby making available to research workers and engineers engaged in development or design one of the most timely collections of first-hand information and data ever published.

All papers are arranged according to subject matter in four major groups: General Methods, Dynamics, Vibrations, Impact; Elasticity, Photoelasticity, Plate Theory, Elastic Stability; Plasticity, Behavior of Materials, Failure; and Fluid Flow, Aerodynamics, Heat. In addition to these papers, five general lectures given in the Congress are included in the Proceedings.

HOW TO CONTROL PRODUCTION COSTS. By Phil Carroll. 272 pages, 6 by 9 inches; 76 figures. Published by the McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y. Price, $5.

Management executives, as well as accountants, will find this volume a practical and understandable guide in the never-ending fight to lower product costs and raise product quality. The author has shown how to both obtain more accurate product costs and control them. A new approach is taken in applying overhead expenses in terms of conversion time and in accordance with rates caused by different products in multiple-product industries.

In detailing the step-by-step procedure for effective cost control, five factors are emphasized; forecasting sales accurately; controlling production to know deliveries, reduce inventory, and shorten the process cycle; eliminating certain finishes and small tolerances by realistic engineering; using incentives; and reporting results promptly.

SIMPLE BLUE PRINT READING WITH SPECIAL REFERENCE TO WELDING AND WELDING SYMBOLS. 207 pages, 6 by 9 inches. Published by the Lincoln Electric Co., Cleveland 17, Ohio. Price, $1 (stiff board cover).

Fourth edition of a book for welders and others engaged in the fabrication of machinery, this manual contains new information and more drawings and photographs than previous editions. It is intended as a guide to a clear understanding of blueprints and how to use them in fabrication and construction.

ENGINEERING MANUFACTURING METHODS. By Gilbert S. Schaller. 613 pages, 6 by 9 inches, 420 illustrations. Published by the McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y. Price, $7.

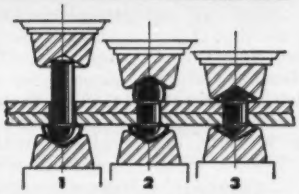
This text is intended to provide a survey of engineering manufacturing methods in a manner that will afford the student some insight into their potentialties. The continuing trend toward industrial specialization to produce a quality low-cost end product poses a challenge to all departments of the manufacturer in proper material selection and economical fabricating methods.

All major aspects of engineering manufacture are considered—founding, machining, welding, hot- and cold-shaping, and heat-treating. Special emphasis is laid on recent technological developments. The economic aspects of manufacture are discussed extensively. Pertinent factors that favor one material, machine tool, or machining method over another are examined, and alternative materials, tools, and methods are evaluated.

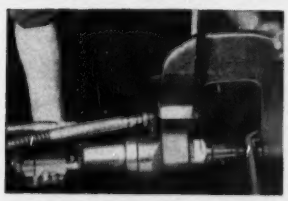
WHY HANNIFIN "HY-POWER" RIVETERS SAVE YOU MONEY

STRONGER JOINTS!

This "silent squeeze" method gives you (1) rapid advance to riveting position, (2) high-pressure shaping of the rivet, cold or hot, and (3) automatic reversal as soon as the rivet is formed. Why are these rivets stronger? Because with this method the rivet shank expands to completely fill the hole and, as the metal flows to shape the heads, fillets are formed under both heads. The rivet is work-hardened, too, and every rivet is uniform.



FASTER RIVETING!



Yes! From the time the button is touched it takes only 2½ seconds to head a ⅜" rivet. *"Hy-Power" is safe, too!* For the stroke can be interrupted and the ram reversed automatically anywhere in the cycle, simply by releasing the control button.

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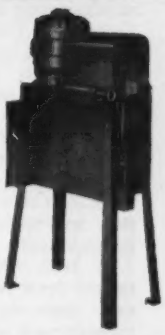
Here's the power source for this modern riveting method . . . it's the Hannifin "Hy-Power" Generator. This compact unit is a combination of motor, pump, oil reservoir, automatic control valves and high pressure intensifier that quietly supplies hydraulic pressure to...



...your "Hy-Power" cylinders—available in 7½, 10, 12½, 17½, 25, 35, 50, 75 and 100-ton capacities (more in multiple). Cylinders can either be mounted in yokes (portable or stationary) or installed in machines of your design.

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Get Bulletin 150. Learn why cost-conscious firms in many fields use "Hy-Power." Just write for your copy of this 32-page book. We'll mail it promptly.

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Obituary

Richard K. LeBlond

Richard Knight LeBlond, founder and chairman of the board of the R. K. LeBlond Machine Tool Co., Cincinnati, Ohio, died on March 17

Richard K. LeBlond

at his home in Cincinnati at the age of eighty-eight years. He had been ill for several months but had been an active participant in company affairs as chairman up to the time of his illness, when he had completed sixty-six years as head of the company he founded. Mr. LeBlond was born in 1864 in Linwood, Ohio. He began his apprenticeship with the Franklin Type Foundry there, and attended night school at the Ohio Mechanics Institute, studying mechanical drawing and general mechanics. His spare time was spent in making small engravers' tools.

In 1887, when Mr. LeBlond was twenty-three years old, he started his own business, specializing in the manufacture of printing type molds, gages, and small tools connected with the type-making industry. Four years later, arrangements were made to build lathes and lathe attachments for another Cincinnati concern, thus entering the machine tool field. In 1898, the company was incorporated under its present name and established in the Linwood area. Eventually, the business outgrew the Linwood facilities and in 1918 moved to its present Norwood site.

Mr. LeBlond resigned the presidency of the company twelve years ago, being succeeded by a son, Richard E. LeBlond. Another son, Harold R. LeBlond, is president of the Cleveland Automatic Machine Co. The elder LeBlond was a charter member of the National Machine Tool Builders' Association. In addition to his sons, Mr. LeBlond is survived by his wife and two daughters.

Coming Events

APRIL 14-15—SEVENTEENTH ANNUAL MACHINE TOOL ELECTRIFICATION FORUM, sponsored by the Westinghouse Electric Corporation, Pittsburgh 30, Pa., to be held at the Hotel Statler and at the Westinghouse Motor and Control Division in Buffalo, N. Y.

APRIL 20 — Aeronautic Production Forum of the SOCIETY OF AUTOMOTIVE ENGINEERS, to be held simultaneously at the Hotels Governor Clinton and McAlpin in New York City. Secretary, John A. C. Warner, 29 W. 39th St., New York 18, N. Y.

APRIL 20-22—METAL POWDER SHOW AND NINTH ANNUAL MEETING sponsored by the Metal Powder Association, to be held at the Hotel Cleveland, Cleveland, Ohio. For further information, write to the Association, 420 Lexington Ave., New York 17, N. Y.

APRIL 27-MAY 8 — BRITISH INDUSTRIES FAIR at Earls Court and Olympia, London, and Castle Bromwich, Birmingham, England. For further information, contact British Information Services, 30 Rockefeller Plaza, New York 20, N. Y.

APRIL 28-30—Spring meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS at the Deshler-Wallick Hotel, Columbus, Ohio. For further information contact Clarence E. Davies, secretary, 29 W. 39th St., New York 18, N. Y.

MAY 18-22—FIFTH NATIONAL MATERIALS HANDLING EXPOSITION sponsored by the Materials Handling Institute, to be held at Convention Hall, Philadelphia, Pa. For further information, write to Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

MAY 20-22—Spring meeting of the SOCIETY FOR EXPERIMENTAL STRESS ANALYSIS at the Hotel Schroeder, Milwaukee, Wis. Further information can be obtained from Wm. F. Hofmeister, Chairman, SESA Meetings Committee, c/o Metallurgical Laboratory, Chain Belt Co., Milwaukee 4, Wis.

MAY 27-29—Seventh annual convention of the AMERICAN SOCIETY OF QUALITY CONTROL at Convention Hall in Philadelphia, Pa. Further information can be obtained by addressing the Society at 70 E. 45th St., New York 17, N. Y.

JUNE 1-3—Annual meeting of the AMERICAN GEAR MANUFACTURERS ASSOCIATION at the Homestead, Hot Springs, Va. Executive Secretary, John C. Sears, Empire Bldg., Pittsburgh 22, Pa.

JUNE 16-19—National Spring Technical Meeting and Welding and Allied Industry Exposition of the AMERICAN WELDING SOCIETY at the Shamrock Hotel, Houston, Tex. Executive secretary, J. G. Magrath, 33 W. 39th St., New York 18, N. Y.

JUNE 28-JULY 2—Semi-annual meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS at the Hotel Statler, Los Angeles, Calif. Secretary, Clarence E. Davies, 29 W. 39th St., New York 18, N. Y.

* * *

Huge Expenditures Forecast for Improved Equipment

American industry will have to invest about $200,000,000,000 by 1960, as much as was invested in the last thirty years, if it is to achieve adequate output to maintain our high standard of living, according to Dean E. Carson, director of business research, B. F. Goodrich Co. Mr. Carson pointed out that studies made by his company indicated a total population in the United States by 1960 of 174,000,000 people.

This population increase will be mainly an addition to the consuming group. Those at work will be faced with the task of supporting a much larger number of people than in any previous period in our history. Except in periods of adjustment, the demand for labor should be so great that all those who are able and willing to work should have little difficulty in finding jobs. But in achieving more productivity, the Goodrich executive said that more effective tools must be provided.

* * *

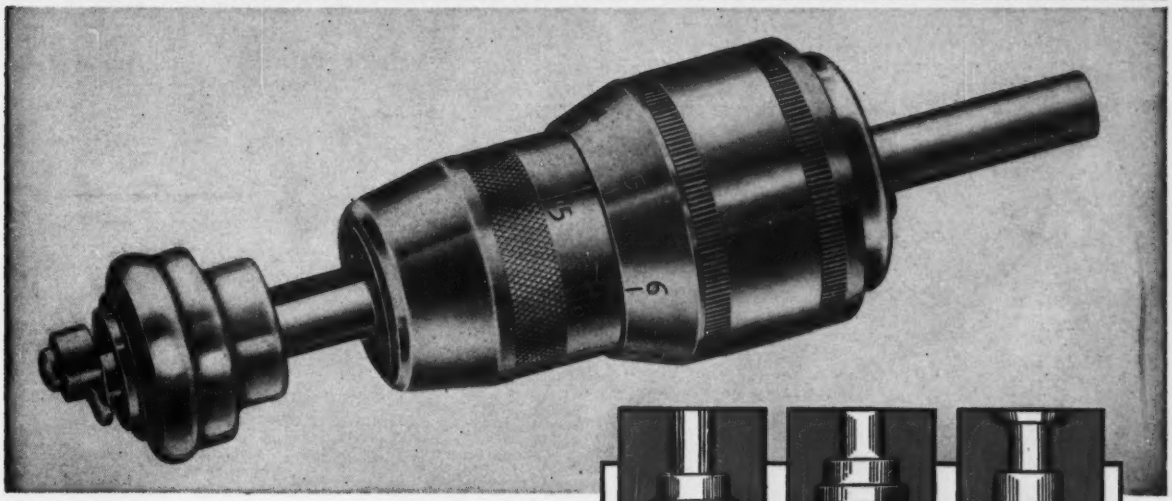
Conference on Cam Design and Tool Selection

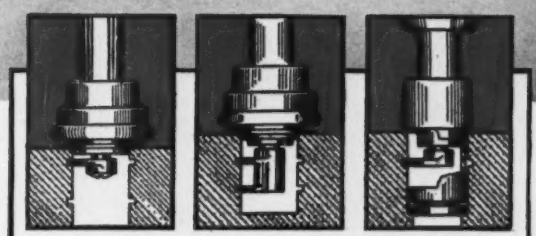
The Rochester Institute of Technology is holding a conference on cam design and tool selection for single- and multi-spindle automatic screw machines from May 18 to 22. The course will emphasize the techniques used by the progressive machine screw industry to increase efficiency and lower costs of production. Two sessions will be held—the single-spindle group meeting the first two and one-half days; and the multi-spindle group, the remainder. Inquiries concerning the course should be addressed to Robert D. Pease, associate director, Evening Division, Rochester Institute of Technology, 65 Plymouth Ave. S., Rochester 6, N. Y.

Waldes Truarc Internal Grooving Tool

for precision cutting of internal grooves in bores and housings

FAST! ECONOMICAL! NEEDS NO SKILLED LABOR!





Groove located from top of hole | Double groove located from top of hole | Groove located from bottom of hole

Internal groove-cutting becomes the simplest of operations with Waldes Truarc Internal Grooving Tool. Easy to adjust—easy to operate...readily adaptable to individual requirements.

Designed for use in any hand drill or automatic drill press and screw machine... assures a concentric recess without injury to metal. Operates by fingertip pressure—especially suitable for unskilled operators.

The Waldes Truarc Grooving Tool when used in an electric or pneumatic hand drill, can be taken to the job eliminating disassembly and excessive handling...resulting in all-around savings in time and costs!

Write now for Catalog giving mechanical details, cutting sizes...extra features...full information

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Waldes Truarc Grooving Tool
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BALDWIN
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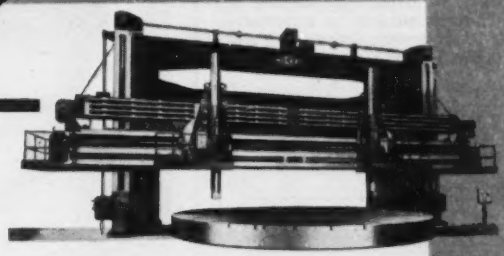
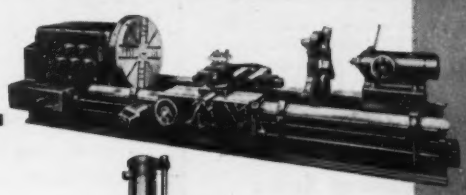
A 12 PAGE FUND OF VALUABLE INFORMATION COVERING PERFORMANCE AND CAPACITIES OF

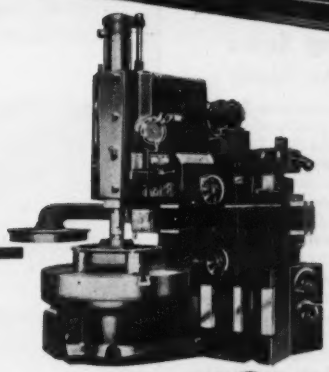
NILES
boring mills



NILES
engine lathes



NILES
railroad tools



HAMILTON
mechanical presses

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BALDWIN
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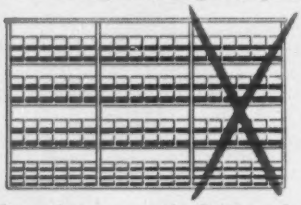
NEWS ABOUT CREATED-METALS

Are Industry Inventories too High?

Business Week recently stated, "Don't underestimate the inventory problem. If a recession starts anytime in 1953, stocks of goods are likely to be at the bottom of it." *Iron Age* pointed out that, "hottest subject in automotive circles today is reducing tooling costs and shortening the tooling time cycle."



Informed sources in the field say that the Carboloy Minimum Tool Inventory Plan (described on these pages) is a forward step in answer to these problems as far as cutting tools are concerned.

★ ★ ★

Woodcutting Saws to Get New Teeth

The Carboloy organization has recently standardized production on 20 solid tungsten carbide tips for circular woodcutting saws. Saws with these carbide tips will soon be available from a number of saw manufacturers and offer phenomenal production increases over steel blades. Tool manufacturers can obtain details and prices by writing for Bulletin W.W.-53-1, Carboloy Department of General Electric Company (address at right).

★ ★ ★

Communications Given Boost by Magnets

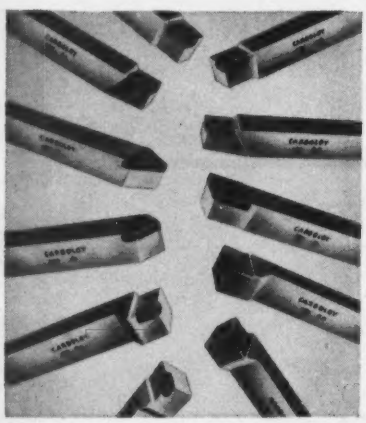
Because they help eliminate costly, bulky coils, Carboloy permanent magnets are being used more and more in communications equipment. The list includes loudspeakers for shops, radio, TV . . . other electrical components in telephones, transmitters, phonographs, hearing aids, etc.

These are the same Carboloy permanent magnets shop men find so useful for separating sheet steel, retrieving tools, holding jigs and doing other handy, timesaving jobs.

YOUR CARBOLOY SALES REPRESENTATIVE SAYS . . .

"Let us show you how up to 1/3

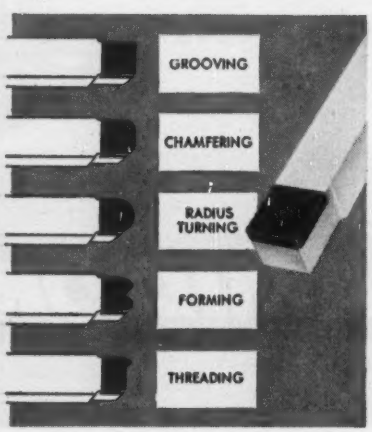
"OUR Minimum Tool Inventory Plan is the answer. It's an easy-to-adopt plan *that works!* Under it, you stock a basic number of low-cost Standard Carboloy Tools in place of many costly "specials." The proposal shows you how to adapt these Standards to almost any single-point tooling job . . . simply and quickly. You use your regular carbide equipment. You'll cut down production delays. You'll reduce your inventories *30% or more.* Read about it on these pages . . . "



1 What are Standard Carboloy Tools?

They are high-quality carbide-tipped single-point tools for turning, boring, facing and other machining operations. They outlast high-speed steel tools as much as 10 to 1 . . . will operate at machine speeds up to 4 or 5 times faster than ordinary tools.

There are only 11 styles of Carboloy Standards. They can be used "as is," or ground – in minutes – to do up to 80% of your single-point tool machining jobs. Carboloy Standards are as near as your phone, too. They are stocked in your area by Authorized Carboloy Distributors.

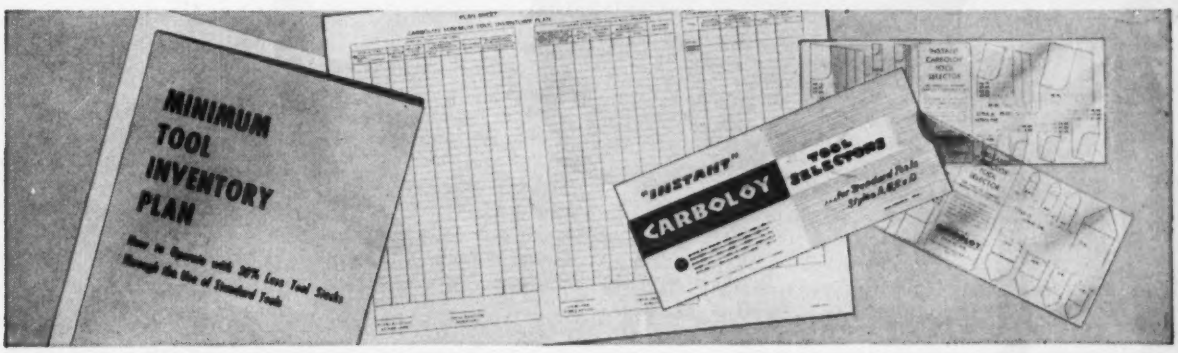


2 Here's how they adapt to your jobs.

At left is a style C Standard Carboloy Tool – one of the 11 styles. Note the generous-sized carbide tip. It can be used "as is" for some jobs . . . or adapted to meet any number of your special tooling requirements (as the 5 typical, adapted shapes at left, for example).

Carboloy Standards can be ground quickly in your own tool room, using an ordinary silicon carbide wheel for the rough grind, a diamond wheel only for sharpening. With a minimum stock of Standards on your shelves, you'll be able to get up to 80% of your single-point machining jobs rolling in a hurry.

to reduce your single-point tool stocks . . . with Standard Carboloy Tools!"

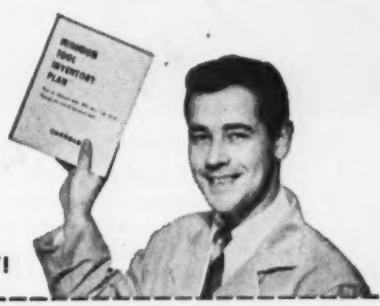


3 Here's why the Minimum Tool Inventory Plan (MTIP) will work for you.

The Carboloy MTIP includes all the helps you'll need to standardize your single-point machining jobs with Carboloy Standard Tools. Send for the free MTIP kit. When it arrives: (1) Review your special single-point blueprints, using the handy plastic Instant Tool Selectors (above) to choose in seconds the right Carboloy Standard Tool to adapt for each job. (2) Enter the findings on the Plan Sheet (above, center), filling in the "...Tools Recommended" section. *That's all there is to it!* Now you can quickly compute what Standards you'll need, how many to stock, how much they'll cost. You'll see at a glance how the MTIP reduces your inventories up to one-third or more . . . lowers initial tool investment, shortens delivery cycles . . . gives you other benefits shopwide.

4 A Carboloy Sales Representative or Distributor will make sure it works.

Before you adopt this plan you can, if you wish, have a carbide expert from the Carboloy factory, district office or nearby Carboloy distributor come to your plant . . . help you get the MTIP rolling. He knows what carbide grades to recommend for particular jobs. He'll show you how Standard Carboloy Tools can pay for themselves in increased production and downtime savings alone. His services cost you nothing.



Carboloy Tools Are Stocked Coast To Coast By

AUTHORIZED CARBOLOY CEMENTED CARBIDE DISTRIBUTORS

Look under "Tools" in the Yellow Pages of your local telephone book, or in Thomas' Register, for your nearby Carboloy distributor. He has complete local stocks and can give you complete carbide service.

"Carboloy" is the registered trademark of the Carboloy Department of General Electric Company.

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☐ Please rush me, at no cost or obligation, full details on your Minimum Tool Inventory Plan.
☐ Have your representative call, without obligation.

Name_____ Position_____
Company_____
Address_____
City_____ Zone____ State_____

Grit Magnified 250 Times

An ANT could carry away this cutting tool

WHICH LED TO NEW CONCEPT THAT CREATED CINCINNATI GRINDING WHEELS

■ The tiny grinding grits shown with the ant is the core of an entirely new approach in grinding wheels. For Cincinnati Milling has proved, beyond doubt, that the grinding process is a true metal cutting process. The grinding grits do not abrade or wear away the surface of a workpiece but form chips which agree in classification with the basic chip types found in other metal cutting processes.

BASIC CHIP TYPES: Photomicrographs of cross sections taken thru partially formed chips obtained under various conditions in machining operations such as turning, milling, planing and broaching.

Type 1—discontinuous or segmental chip

Type 2—continuous chip without built-up edge

Type 3—continuous chip with built-up edge

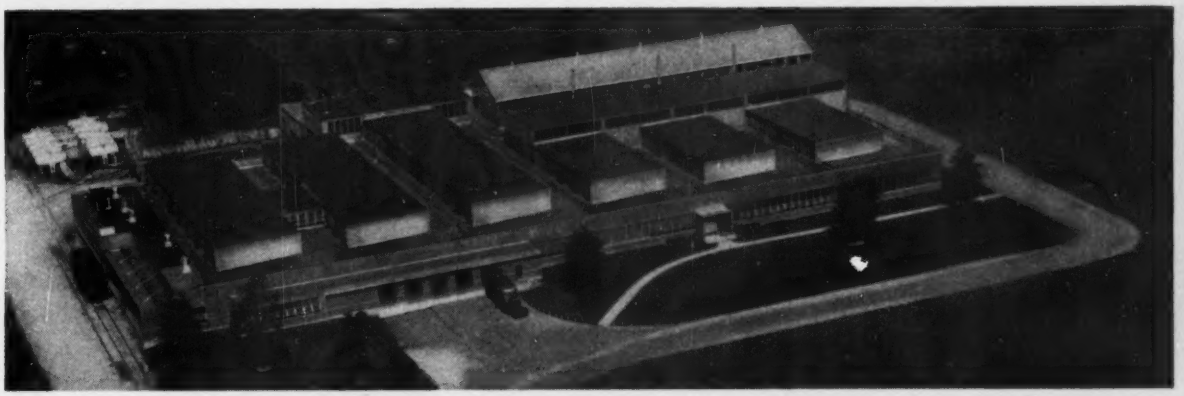
This new concept is not based on hasty conclusions. It represents 25 years of research by The Cincinnati Milling Machine Co. in chip formations, coupled with practical experience in applying the basic fundamentals of grinding to a wide variety of work on both centerless and center-type machines.

This new concept is the beginning of a new approach to grinding wheels—the development of the wheel as a true cutting tool. And it is a development you might expect from Cincinnati Milling, with the world's largest background of research and experience in metal cutting operations.

For you, this means grinding wheels developed and tested over a period of several years on the basis of true function—as true cutting tools forming true chips.

Available to you is a field organization of trained machinists who know grinding and grinding machines as well as grinding wheels. They can serve you well.

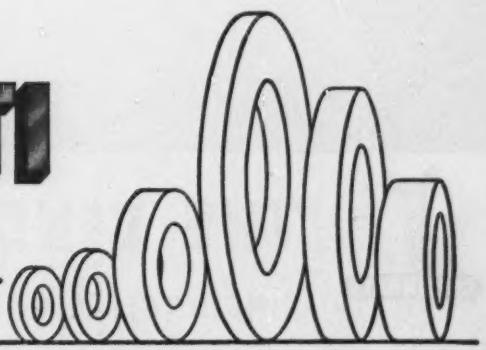
We'll be glad to show you how to get the most out of Cincinnati Grinding Wheels. For a demonstration in your own shop—on one of your own machines—contact us at once. Write, wire or telephone the Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.



Cincinnati Grinding Wheels are manufactured in this new, completely modern plant.

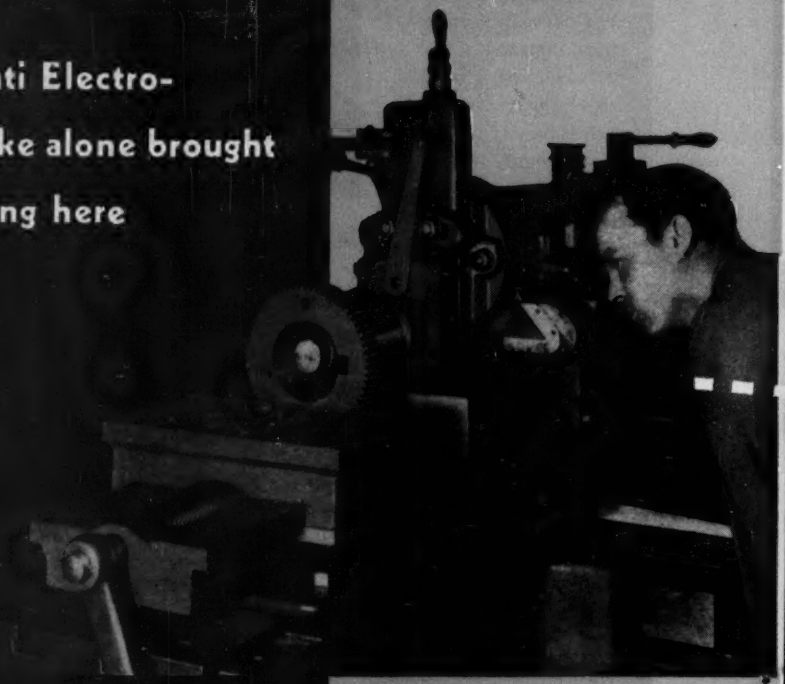
FREE BOOKLET. Now available to industry is a new booklet entitled "A New Concept In Grinding Wheels." It contains valuable information for everyone interested in grinding operations. A copy is yours for the asking. Just write Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

CINCINNATI
Grinding Wheels
THE CINCINNATI MILLING MACHINE CO.
Cincinnati 9, Ohio



Outstanding Time Saver...

The New Cincinnati Electro-Magnetic Clutch and Brake alone brought a 30% time-saving here



The New Cincinnati Magnetic Clutch and Brake, with its single, convenient control lever, gives the operator the fastest, simplest and most accurate control of his Shaper and converts waste time into productive time.

This powerful clutch and brake requires no adjustment, and has a long, maintenance-free life.

Write for Cincinnati Shaper Catalog N-5.

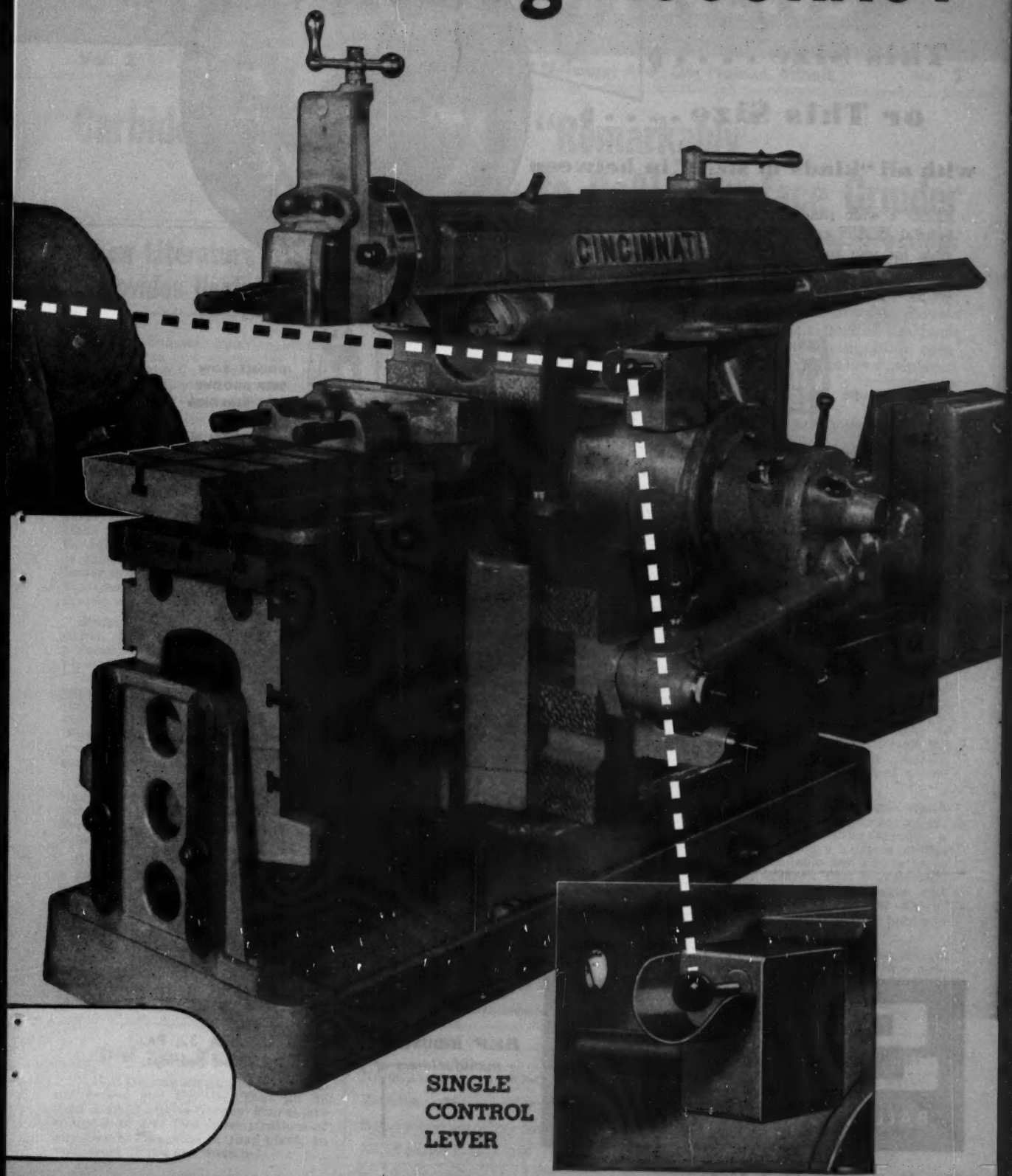
Shaping time on 7 internal oil grooves in these steel sleeves was reduced from 12.5 minutes to 8 minutes, by the Cincinnati Electro-Magnetic Clutch and Brake.

CINCINNATI

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

....Outstanding ACCURACY



SINGLE
CONTROL
LEVER

This Size . . . .

or This Size . . . .

with all "kinds of sizes" in between

SKF's wide range of bearing types and sizes, plus helpful SKF engineering cooperation, makes it possible for you to select the bearing whose characteristics make it the best bearing choice for your particular application.

SELF-ALIGNING BALL BEARINGS

Compensate for angular misalignment resulting from faulty mounting, shaft deflection or distortion of the foundation. For radial loads and moderate thrust loads in either direction.

SPHERICAL ROLLER BEARINGS

Unexcelled for capacity. Inherently self-aligning. The full capacity of the bearing is always available for useful work. Will carry substantial thrust load in either direction.

DOUBLE-ROW DEEP GROOVE BALL BEARINGS

Embody the same design principle as the single-row type, but have lower axial displacement and substantial thrust capacity in either direction. Have very high radial capacity.

SINGLE-ROW DEEP GROOVE BALL BEARINGS

Sustain, in addition to radial load, substantial thrust load in either direction even at high speeds. Available with famous Fairprene Red Seals which keep dirt out and lubricant in. Also with any combination of Red Seals, shields, and snap-rings. Furnished in standard or precision tolerances.

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Support heavy thrust load in one direction, sometimes combined with moderate radial load. Can be mounted singly or in tandem for constant thrust load in one direction; also in pairs, face-to-face or back-to-back, for combined thrust and radial loads.

CYLINDRICAL ROLLER BEARINGS

Very high radial capacity and low friction which permits high-speed operation. Easy to dismount, even when both rings are mounted with a tight fit.

BALL THRUST BEARINGS

For pure thrust load in one direction only. Not self-aligning. The load line through the balls is parallel to the shaft axis, resulting in high thrust capacity and minimum axial deflection.

SPHERICAL ROLLER THRUST BEARINGS

For heavy thrust loads, or combined loads which are predominantly thrust, at high speeds on vertical or horizontal shafts. Fully self-aligning.

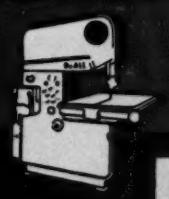
SKF®

BALL AND ROLLER BEARINGS

SKF INDUSTRIES, INC., PHILADELPHIA 32, PA.

— manufacturers of SKF *and* HESS-BRIGHT *bearings.*

7368



PRODUCTION NEWS

SAW BANDS • GAGING EQUIPMENT • TOOL STEEL • CUTTING TOOLS • INDUSTRIAL SUPPLIES

Vol. 2 Published by The DoALL Company, 254 N. Laurel Ave., Des Plaines, Illinois No. 2

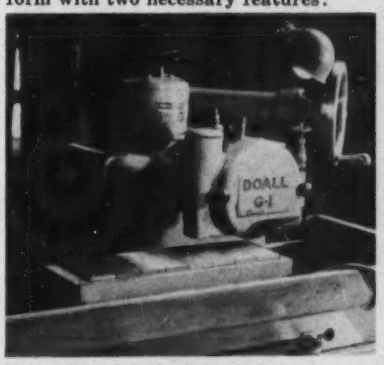
Carbide Tool Output Upped "Remarkably" by Change to DoALL Surface Grinder

7 Times More Pieces Before Each Wheel Dressing; Work Now Done in One Pass — Formerly Took Two

That there are radically varying standards of performance among surface grinders and that replacement of inefficient or obsolete models is a profitable investment, is amply evidenced by the report of Radform Tool Company, East McKeesport, Pa. The accompanying table compares performance of their DoALL Grinder with the machine it replaced for diamond wheel grinding of carbide inserts used in milling cutters.

Although the Radform Company classed the DoALL performance as "remarkable", an analysis of the reasons for the improvement show that it could have been anticipated.

The DoALL Grinder provided Radform with two necessary features:



View of the full chuck load of 64 pieces on DoALL Grinder at Radform Tool.

1. *Rigidity*—enabling the grinder to take heavy cuts with extreme accuracy across the *entire* work area. This permits the entire chuck area to be utilized for the work. An additional benefit of rigidity was elimination of wheel "bounce", which, particularly in the case of a diamond wheel, causes rapid breakdown and frequent need for dressing.

2. *A More Powerful Chuck*—capable of holding the pieces without blocking which takes up space otherwise usable for the work load.

Close-up showing serrations on bottom of work pieces which reduce surface area available for magnetic attraction. Only a powerful chuck could hold these pieces without any blocking around them.

The rigidity of a DoALL Grinder stems from no single feature, but is a composite result of the entire design. And, it is this rigidity, the ability to hold "hair-splitting" tolerances on the work piece with the grinder controls, that is the primary function of a surface grinder.

Some of the design elements which contribute to DoALL rigidity are an extra long column, a husky spindle, a heavily ribbed frame, a uniform oil film delivered to the table and saddle ways under meter control. This ever-present oil pressure maintains clearance and prevents loss of table-to-wheel dimensional accuracy even under the pressure of heavy cuts.

Other data on DoALL Grinder design and performance are covered in a new 20-page catalog available upon request.

Performance Table — DoALL Grinder, Radform Tool Company

	DoALL Grinder	Previous Grinder
No. of pieces per chuck load	64	20
Blocking needed to hold work on chuck?	No	Yes
No. of pieces per wheel dressing	512	40
No. of passes to take .018" cut	1	2

—See Next Page—→

New Literature Provides Useful Data

New techniques, new applications, new products and accessories are described in the Catalogs and Bulletins listed below. Copies are available free upon request, without obligation.

DoALL Precision Hydraulic Surface Grinders—20 pages. How new DoALL Grinders can be applied to a wide variety of surface, cylindrical and form grinding jobs is explained and pictured. Attachments for fully automatic grinding, skip feeding, automatic cross feed reverse, crush dressing and other operations are described. Patented "Cool-Grinding" (coolant *through* the wheel) is shown as a means to heavier cuts, better finishes and faster output. Specifications and design features of the new models are included.

Modern Measurement Control—16 pages. The need for millionths inch accuracy in dimensional gaging is explained and pictured under the heading "The Evolution of the Inch" in this new gage block catalog. Illustrations of 12 steps in their manufacture tell "why you can trust DoALL Blocks". DoALL Block Sets, from 5-piece to 118-piece, are illustrated and listed. Other gaging equipment and accessories are shown.

Because gage blocks should be periodically checked for accuracy and condition, DoALL Laboratory Calibration Service for users of any make of blocks is described.

DoALL Micro-Step Gaging System—4 pages. The means for putting gage blocks to work in the shop and toolroom as well as the inspection department are explained in this new bulletin. Illustrations show methods for assembling thousands of different gages with standard rectangular gage blocks, new DoALL block Holders and End-Standards which provide uninterrupted measuring surfaces at each end of an assembled gage.

Did You Know . . .

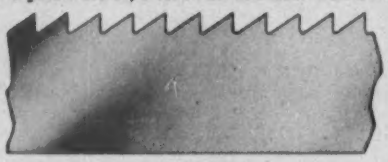
. . . that you can see any DoALL product *before* you buy it? That all 38 local DoALL Sales-Service Stores are equipped to give free demonstrations of any DoALL machine in your plant, on your work if you ask them to?

Users Reports Show Importance of Saw Band Selection

Blade Type, Pitch, Width, Set Pattern Greatly Influence Performance of Any Contour or Cut-off Band Saw

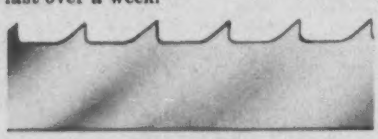
Often the efficiency of continuous sawing with a contour band machine or horizontal cut-off band saw is seriously impaired by incorrect selection of a saw band for the job. Recent reports from DoALL saw band users strongly emphasize this point. Here are typical reports:

1. *Cut-off time reduced from 1½ hours to 1½ minutes!*—cutting 4½" O.D. 14-S aluminum bars on a Kalamazoo machine. Using a standard ¾" wide 6-pitch blade, 1 hour 20 minutes was required to cut one bar. After switching to a ¾", 3-pitch DoALL *Claw Tooth* blade, cut-off time was reduced to 1 minute 20 seconds! This job required a different pitch and type of blade than that originally used.



Precision

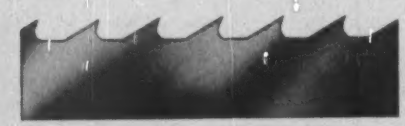
2. *Blade life increased 20 times!*—miscellaneous cut-off work formerly consumed 3 or 4 blades daily. A change to the new DoALL positive rake *Claw Tooth* was recommended by the DoALL Saw Specialist. Result: the new blades last over a week.



Buttress

3. *Cut armor plate twice as fast*—use of an 18-pitch saw band required five minutes cut-off time on tough armor plate. Use of a *6-pitch* DoALL blade reduced cut-off time to 2 minutes.

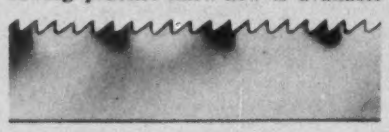
4. *Eliminates trouble, saves time*—a change-over from a ¾" width 12-pitch *raker set* blade to DoALL ⅝" wide 8-pitch *wave set* blade eliminated trouble for a Wells saw user, reduced cut-off time 25 minutes per piece on 8¼" steel. Here, width, pitch and set pattern all contributed to the improved performance.



Claw-Tooth

5. *Improves performance*—change from a standard 8-pitch blade to a 6-pitch DoALL *Buttress* blade improved performance for a Kalamazoo customer to the extent he has standardized on the DoALL band.

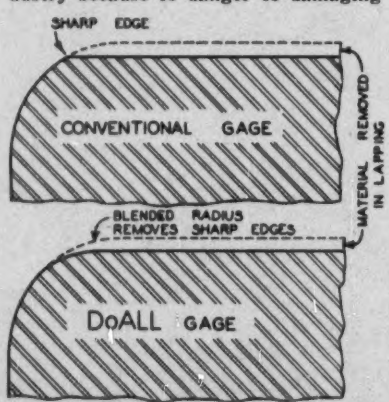
When DoALL Saw Specialists recommend changes in the types of saw bands being used by customers, the results bear out the recommendation. DoALL's sawing practice know-how is available to band saw users who request the services of a DoALL Specialist.



Cut-off

DoALL Gage Blocks "Burr-Proofed" for Accuracy, Long Life

Sharp edges on a gage block will become burred in normal usage. Even a two-millionths inch burr can make a block unsuitable for use. To prevent such burrs it is standard practice in manufacturing gage blocks to round the edges before final lapping. However, the final lap creates new sharp edges. Rounding the edges after final lapping has generally been avoided by the industry because of danger of damaging the accuracy of the blocks.



To meet this problem DoALL has developed an exclusive process for re-rounding the edges after a final lapping without distorting or damaging the block. As a result, DoALL Blocks have rounded, burr-proofed edges. They are guaranteed to equal or exceed National Bureau of Standards requirements for dimension, flatness and finish. DoALL manufactures all blocks in air conditioned laboratories under exacting control and inspection procedures.

Special Sizes, Tolerances DoALL Ground Flat Stock Save Time and Money

DoALL Precision Ground Flat Stock (oil hardening tool steel) is now available on special order accurate to plus or minus .0005" to meet aircraft and other industry specifications. Standard accuracies are plus or minus .001".

In addition to 251 standard sizes carried in stock, DoALL can also provide a wide variety of special sizes including lengths up to 120" and widths up to 20".

Selection of the size of Ground Flat Stock to best meet a given requirement results in substantial time and material savings. A bulletin describing DoALL Flat Stock and a wall chart of sizes are available upon request.

DoALL Packaged Service Cuts Downtime and Repair Costs

A new approach to machine repair and maintenance has been introduced with the DoALL Package Service Program, which emphasizes preventive maintenance rather than costly last minute repairs. A unit price for each "package" includes parts and installation.

Repairs are made by factory-trained technicians using genuine DoALL parts. Rather than replacing a single part, mating parts or complete assemblies are replaced. Such replacements can be made during a single service call more economically and with less downtime than if the parts were replaced, one by one, over a longer period. Machine performance and productivity are kept at maximum efficiency.

Forty-one DoALL Saw and Grinder assemblies are covered by the new service program, including: welders, air pumps, table bearings, table cylinders, grinder spindles, Selectron, transmissions and others. There are also several basic overhaul packages.

Did You Know...

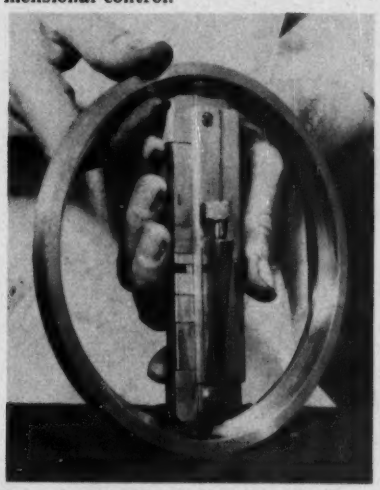
...that new DoALL Precision Surface Grinders can take heavier cuts with greater accuracy, and without burning the work, than is possible with any other surface grinder?

Gages of Any Length Now Made with Gage Blocks

New DoALL Micro-Step Gaging System Simplifies Checking of Parts, Other Gages and Machine Tool Set-ups

Gages up to six feet or more in length, accurate to millionths of an inch, can now be made up quickly and easily with standard rectangular (USA type) gage blocks.

The unique design of the DoALL Micro-Step Gaging System makes possible assembly of internal gages, indicating gages, pin gages, snap gages, depth gages, scribers and many other instruments. With this System, direct use of gage blocks can now be made for checking of parts, gages, instruments and machine tool setups. The cost of many special gages can be eliminated and rejects can be reduced through more accurate dimensional control.



Internal gage, using ball end standards

Two components of the Micro-Step System make such gages possible and practical for use in the inspection department, toolroom and shop:

1. *New Gage Block Holders.* Adjustable channel type holders are available in standard lengths up to 72" for making a wide variety of gages. Longer lengths are also available. A unique caliper holder is ideal for making outside and inside calipers, dividers, scribing compasses and other instruments up to 6" dimensions.

2. *Fully Exposed End Standards.* These are specially designed gage blocks which are inserted at each end of the holder to provide the actual measuring surfaces of the assembled gage. Their unobstructed surfaces extend beyond the ends of the holder, permitting many setups never before possible with gage blocks and holders. Ball ends, foot blocks, center points, scribers and many other end standards are available such as the dial indicators to assemble indicating gages.

DoALL Caliper Holder for gage blocks and end standards

6-foot indicating gage made by assembling gage blocks in holder.

The expendability of gage blocks is considerably reduced as there is less wear, although their use is greatly increased. The gages are wrung together by the *moderate pressures* of the holder clamps so that there is no distortion due to squeezing. The wear caused by rubbing action when gage blocks are wrung manually is entirely eliminated. Assembly in the holders minimizes the chance of dropping the blocks or otherwise damaging the measuring surfaces. The blocks do not contact the work being checked, the End-Standards take over this function.

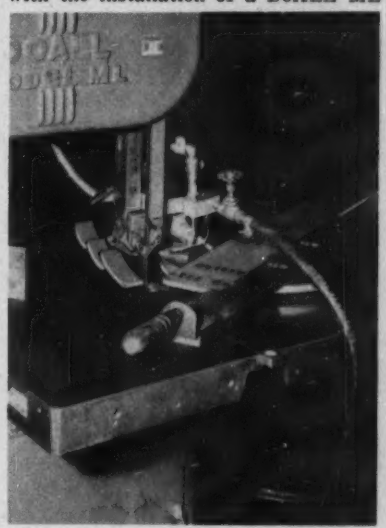
A complete explanation of the components of the new Micro-Step System and how they are assembled is contained in a new bulletin available upon request.

Production Tripled, Material Saved with DoALL Contour Machines

The Helwig Tool Company, St. Paul, Minn., faced with the problem of producing an aluminum part which could not be blanked to shape found, after trying other methods, that contour sawing on a DoALL Band Machine was the fastest, lowest cost method available.

Blanking failed because the 75 ST aluminum hard alloy chipped and peeled. Until contour sawing was tried, the blanks were sheared and their radii trimmed on a lathe, using a special fixture. This time-consuming method limited production to 200 pieces per hour.

This figure was jumped to 600 pieces with the installation of a DoALL ML Contour machine. Time per piece was cut from nearly 30 to only 6 seconds.



Showing fixturing for cutting shapes on DoALL machine at Helwig Tool Co.

In addition, the neat, slicing process of contour machining saved 33⅓% of expensive aluminum alloy lost in the former shearing and turning process.

This supplier, once behind his schedule, now has a 7 weeks bank of parts waiting use.

Two DoALL Stores, Three Dealers Serve Canada

Complete service and information on DoALL products is readily available to Canadian plants by calling the DoALL Sales-Service Stores in Toronto and Montreal, or the following dealers: T. S. Taylor Machinery Co., Ltd., 187 Bannatyne Avenue, East, Winnipeg, Manitoba; Mechanics Supply Company, 10234 103rd Street, Edmonton, Alberta; Thomas Skinner & Son, Ltd., 14 Powell Street, Vancouver, B.C.

———See Next Page———→

Bulletin Gives Tips On Hack Saw Blade Use

Included in the bulletin "DoALL Hack Saw Blades" are the following tips on how to secure greater sawing efficiency and longer blade life:

Hints On Power Blades

1. Start cutting at a point where the most teeth come in contact with the work.
2. Keep the saw tight—loose blades wear more quickly, don't cut straight.
3. When the blade becomes too dull to cut satisfactorily start the next piece with a new one.
4. A new blade with sharp teeth should not be forced as much as an old one.
5. Be sure coolant is flowing before blade contacts work.

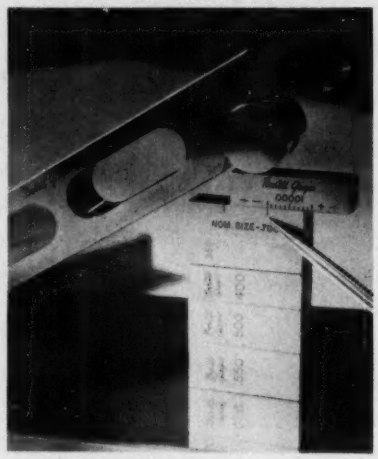
Hints On Hand Blades

1. Point teeth away from handle.
2. Be sure blade is straight and taut (but not so tight it will pull away at pin holes).
3. Material should be held rigidly in a vise.
4. Starting strokes should be easy and slow, at a very slight angle to material. When starting a cut at a corner use a very light stroke until cut is long enough for three teeth to cut at a time.
5. Bear down on the forward stroke enough to make teeth cut. Raise up on return stroke to avoid dragging teeth, dulling blade.

The bulletin also contains a speed and feed chart for power hack saw blades, selection charts, specifications and prices on all types of DoALL power and hand hack saw blades.

DoALL Vernier Blocks Greatly Extend Range of Use of Any USA Gage Block Set

The usefulness and multiplicity of dimensions obtainable from any rectangular gage block set can be greatly extended by adding to it a pair of DoALL Vernier Blocks. These blocks provide means for setting up heights in increments of 10 micro-inches. Nominal height of the set is .700", but one surface of each block is tapered. The height increases as the upper block is moved to the right, decreases as it is moved to the left. The amount of change is indicated by 10-micro-inch graduations on the upper block as shown in the illustration. Price is available upon request.



Showing DoALL Vernier Blocks in use with DoALL Sine Bar

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Vol. 2—No. 2—62M—3-53

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B SERIES • Light duty, one direction ball thrust bearing. Flat seat. Flat races. Bronze ball retainer . . . 38 sizes ½" to 3½" I.D.

C SERIES • Light duty, one direction ball thrust bearing. Flat seat. Flat races. Pressed steel retainer . . . 16 sizes ½" to 1⅞" I.D.

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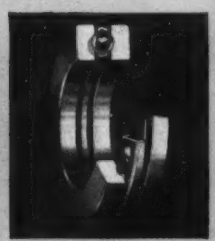
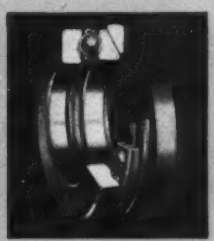


1100 SERIES • Medium duty ball thrust bearing. Grooved races. Pressed steel or bronze (large sizes) retainer . . . 23 metric sizes 10 to 140 mm. I.D.



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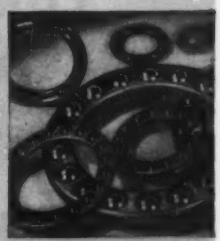
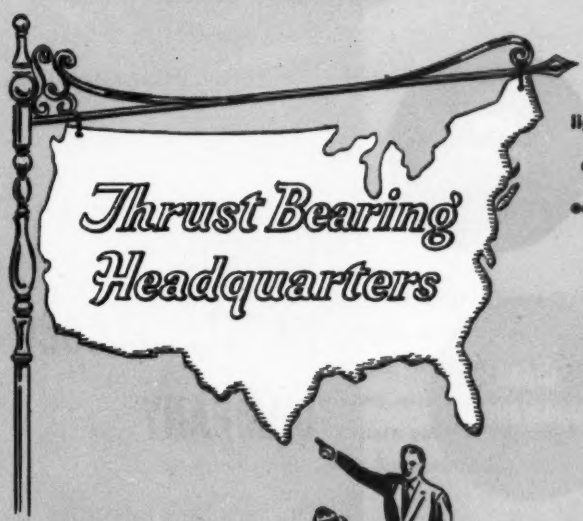
W SERIES • Case hardened and ground flat washers for various Thrust and Spacer applications. Slip fit. 38 sizes ½" to 3½" I.D.



R SERIES • Ball thrust retainer. One piece, pressed steel, channel type cage . . . 79 inch sizes 0.266" to 4.232" I.D.

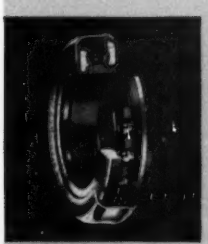


Just Name Your Need

Whatever mechanized equipment you make or use—whether it is large, small, rugged, fragile, heavy or light—whether it must operate at high speed, low speed, under water, in acid or under extreme temperature or dust conditions, it will do its job better, more efficiently and more economically if bearing equipped. If it is equipment that lends itself to bearing applications of the thrust type—Aetna has the answer or can come up with it pronto. 37 years of thrust bearing know-how assures this. Inquiries invited. No obligation. Aetna Ball and Roller Bearing Company, 4600 Schubert Ave., Chicago 39, Illinois.

Aetna

Precision Bearings and Parts for Every Branch of Industry



CLUTCH BEARINGS • Ball thrust clutch release bearing. Banded. Pre-lubricated. T-type, oil impregnated bronze retainer assures concentricity and smooth, quiet, long-life performance.

SPECIAL BEARINGS • Facilities for sizes up to 38" O.D. Counsel that brings you the expert technical aid that has licked many of industry's toughest bearing application problems.

PRECISION PARTS • Aetna is versatile—can mass-produce vital parts in almost limitless sizes and shapes—to your most exacting metallurgical, tolerance and finish specifications.

Write **for latest catalog. Contains specifications on Aetna's complete line—vital technical reference data on bearing selection, load capacities, lubrication, care and maintenance.**

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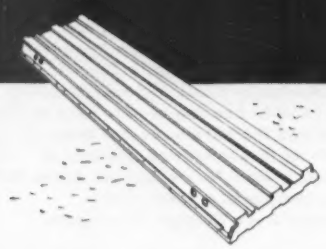

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The above, combined with *Courtesy* and *Service*, are, we like to feel, the real reasons why "Phillie Gears" are *always gears with a future.*

Write for our latest Gear Catalog.

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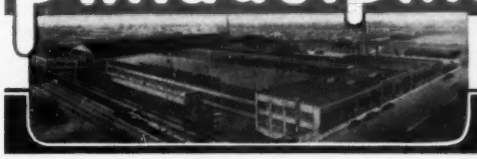

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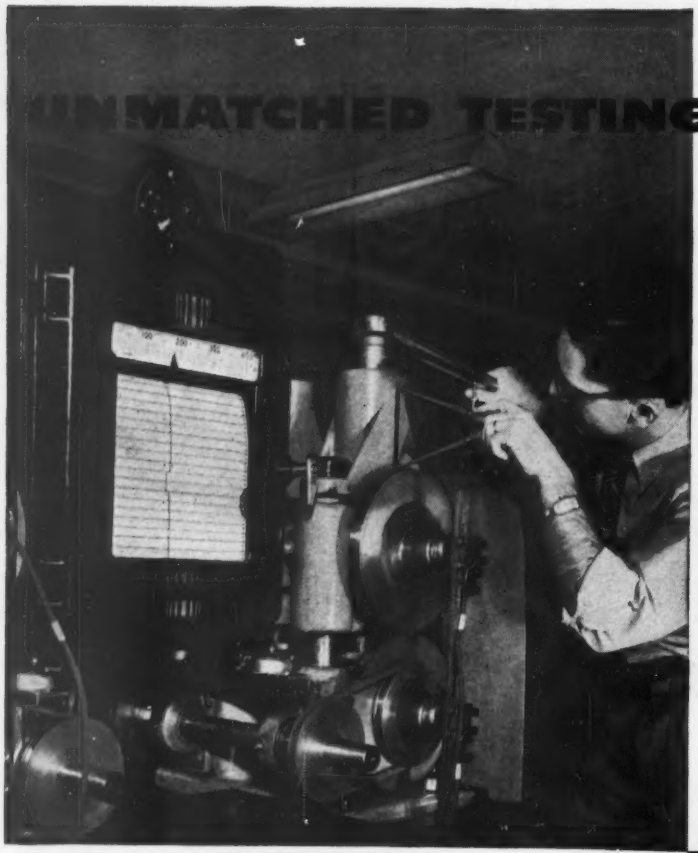

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one of many reasons for Hyatt leadership!

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THIS IS THE CUTTING FLUID YOU TOLD US YOU NEEDED

YOU WANTED STRENGTH OF FILM
which would give you longer tool life

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one cutting fluid to do 90% of all jobs

YOU WANTED GERMICIDAL PROPERTIES
no rancidity, freedom from skin sores

YOU WANTED COOLER WORK
which could be handled bare-handed

YOU WANTED LOWER COSTS
how's 8¢ a gallon, in the machine?

THE ANSWER IS:

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—not a mere water soluble oil, but a fortified concentrate scientifically developed to give you "100 oils in one!"

ANTISEP "saves the day" for Cleveland valve manufacturer—cuts cost 50%!

After several prominent cutting fluids had failed to meet requirements, this concern decided to try Antisep, diluted 25 to 1, in the machining of valve stems from 416 stainless steel. Warner & Swasey 5-spindle automatic screw machines were used. Result: lower costs, improved tool life, greater uniformity in pieces machined. Parts come off cool, permitting higher speeds and heavier cuts.

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Ready to give you on-the-job service . . .

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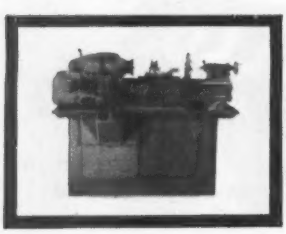
9" x 24" Tool and Gage-Makers' Lathe with Electronic Motor Control

Now you can have the advantages of quiet, simple, modern Hendey Electronic Motor Control on the Hendey 9" x 24" Tool and Gage-Makers' Lathe. These advantages include stepless spindle speeds from 25 to 3000 R.P.M. by potentiometer control of both field and armature of the 3 H.P. d-c motor. Exceptionally close speed control is obtained even under changing load. I.R. compensation gives full torque at low speeds over the complete armature control range. A full stop from maximum speed is accomplished in approximately 1½ seconds. Starting, stopping or reversing, even at 3000 R.P.M., is accomplished smoothly and rapidly. This new drive is optional equipment, and full information is available in our new 9" x 24" Lathe catalog. Write for your free copy! It gives full details on the new drive as well as other features of the Hendey 9" x 24" Lathe, which guarantee precision output with minimum effort.



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Jet Engines create *chucking* problems

The Cushman Chuck Company has engineered and designed an entirely new and tested approach to the problem of holding jet engine discs and rings. These new chucks have been developed in strict accordance with the principles of rapid-production techniques and chucking rigidity *without* distortion.

Designed for both hand and automatic chucking operations. Engineered to your requirements.

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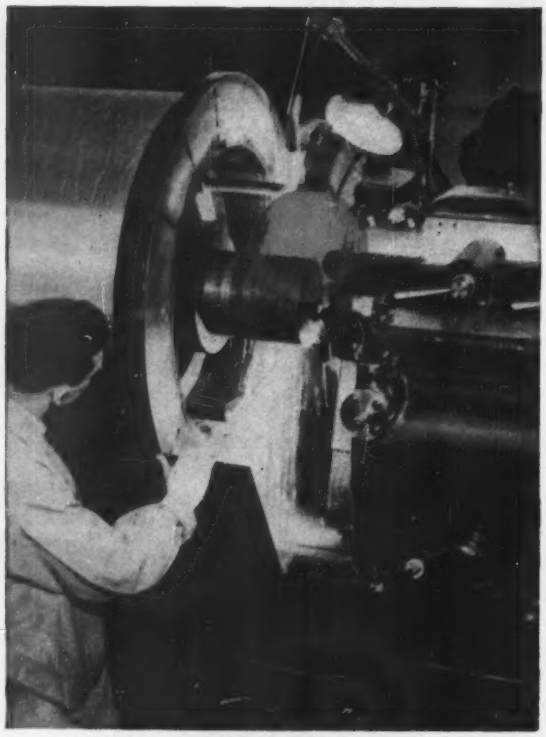
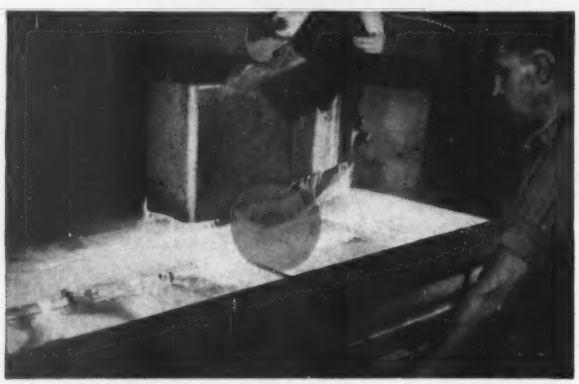
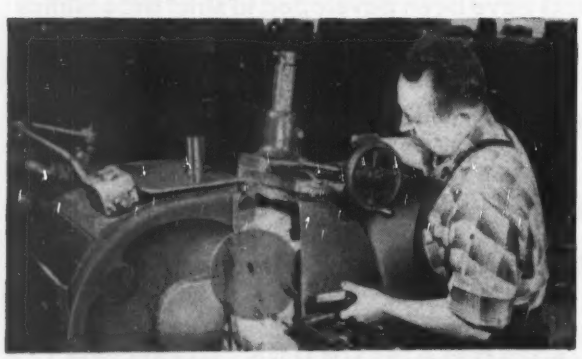


YOU CAN SEE THE DIFFERENCE. The spark stream from a Norton G Bond ALUNDUM wheel is more continuous, more even, indicating uniformity of wheel structure and of cutting action.



YOU CAN HEAR THE DIFFERENCE. Norton G Bond wheels grind with the pleasant, steady swish-h-h of free, easy cutting. You hear no harsh grinding noise.



YOU CAN PROVE THE DIFFERENCE. From general purpose to high production work, every job you do with the new G Bond wheels will benefit by the unique cutting action that grinds faster, freer, and cooler.

NOW!...Boost your profits with the NEW

G BOND

for your latest Norton value-adding

"TOUCH OF GOLD"

It took five years of continuous research and field-testing to bring you the new, exclusive Norton G Bond.

Now the most efficient vitrified bond ever produced is ready to add your latest "Touch of Gold" for increased product-value — and profits — in a wide range of precision and semi-precision grinding jobs.

Secret of the new G Bond's great superiority is the way it holds each abrasive grain for maximum cutting action. Then, *just when it should,* it lets go, assuring a constant grinding surface of new grains with fresh, sharp cutting edges. It is designed to do this better than the bond in any wheel you have ever used before.

As a result, Norton ALUNDUM* grinding wheels made with the new G Bond have definite advantages that you can *see* and *hear* as they grind — and that are *proved* in the better work they turn out for less cost.

That's your newest "Touch of Gold" developed by Norton to help boost your profits and keep your operators happy. Make sure you add it to your production. And remember, only Norton offers you over 65 years of experience in abrasives, grinding wheels and grinding and lapping machines.

SEE YOUR NORTON DISTRIBUTOR

about arranging a test of the new G Bond ALUNDUM wheels in your plant. Or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

THE "TOUCH OF GOLD" IS JOB-PROVED. During extensive field-testing, the new Norton G Bond wheels have made a big hit with operators experienced in many types of grinding. Why not get first-hand reports on these radically improved wheels? Try them in your own shop.

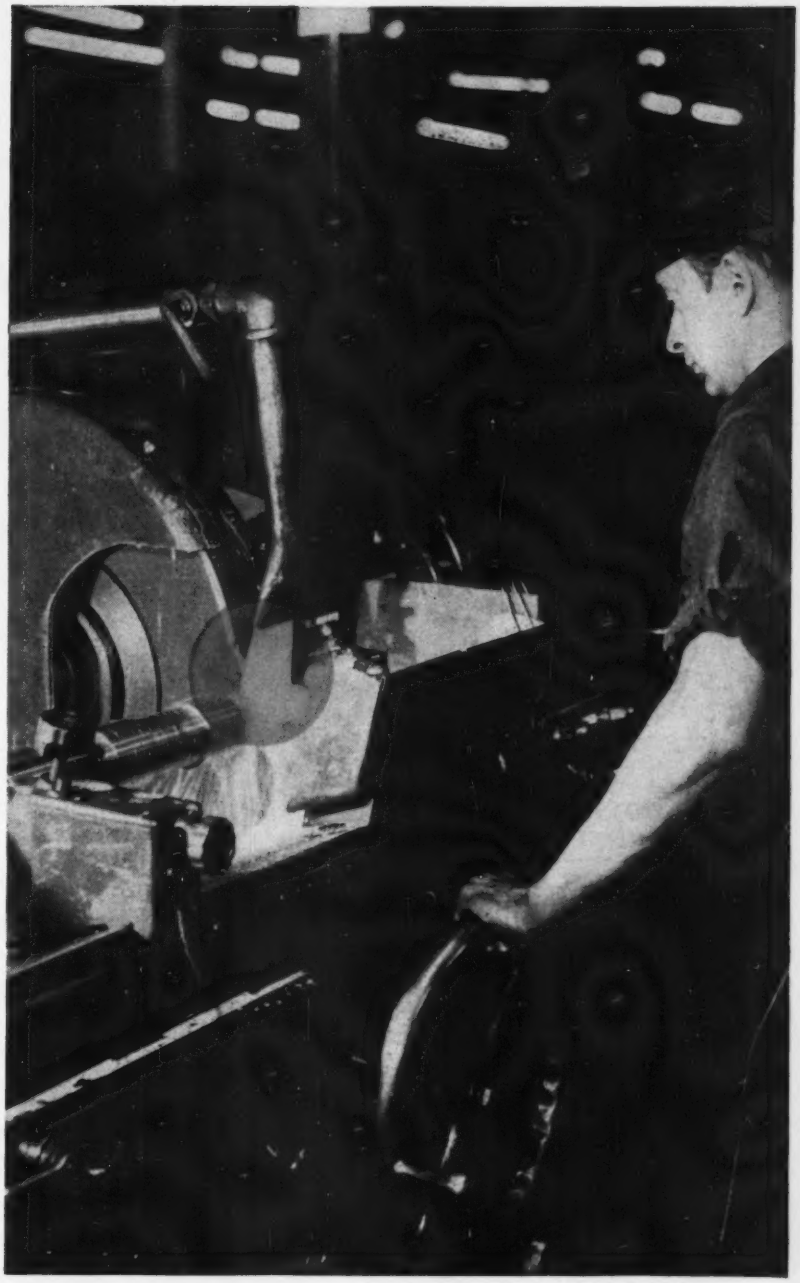
7 BIG ADVANTAGES Norton G Bond ALUNDUM Wheels:

- Do more work per wheel
- Cut freer, cooler, faster
- Dress easier — more pieces per dressing
- Cover a wider range of jobs
- Hold shape — better for form grinding
- Hold corners better
- Ideal for crush dressing

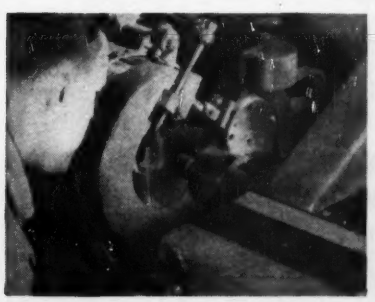
NORTON
ABRASIVES

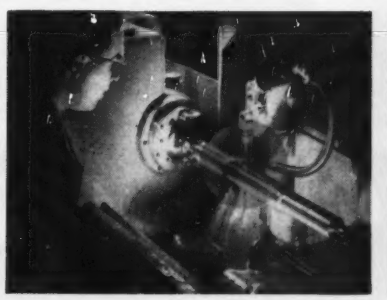
Making better products to make other products better

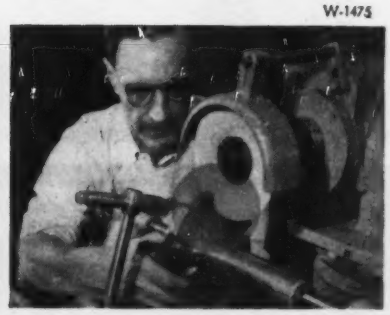
*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries



W-1475



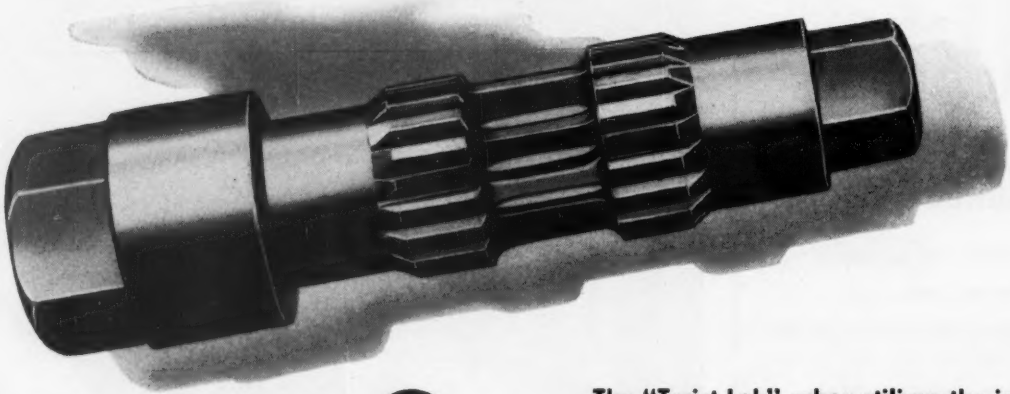


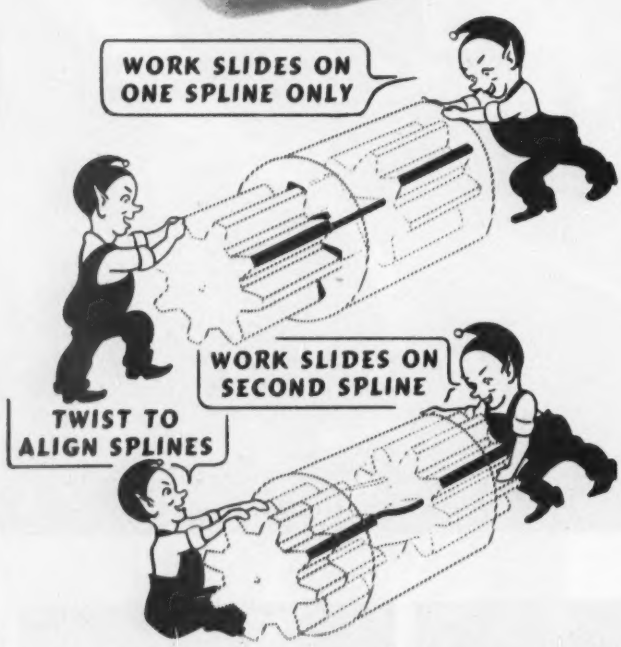


BROAD USEFULNESS. The new Norton G Bond ALUNDUM wheels can boost your profits on many types of grinding, especially cylindrical, centerless, surface, internal, gear, tool and cutter, form and thread grinding, and saw gumming.

A NEW TWIST IN ARBORS

The Woodworth TWIST LOK *principle for splines*





The "Twist-Lok" arbor utilizes the inherent strength of tough, durable spring steel. There are no moving parts to wear. The Twist-Lok principle insures —

Accuracy you can trust

In a relaxed state, two spline surfaces are finished machined out-of-alignment. A part placed on the arbor goes on the first locating surface easily. With a twisting motion (wrench or air-operated) the reeds are "wound" permitting the spline surfaces to align, and allowing the part to be loaded. The twisting action is released and the part is chucked by the unwinding of the reeds.

One chucking surface is firmly against one wall of the part spline, the other chucking surface is firmly against the opposite wall of the part spline.

Your spline part is chucked securely and on center within a fraction of the concentricity tolerance.

The "Twist-Lok" arbor is additional proof that Woodworth Chucking Specialists have the answer to your chucking problem.

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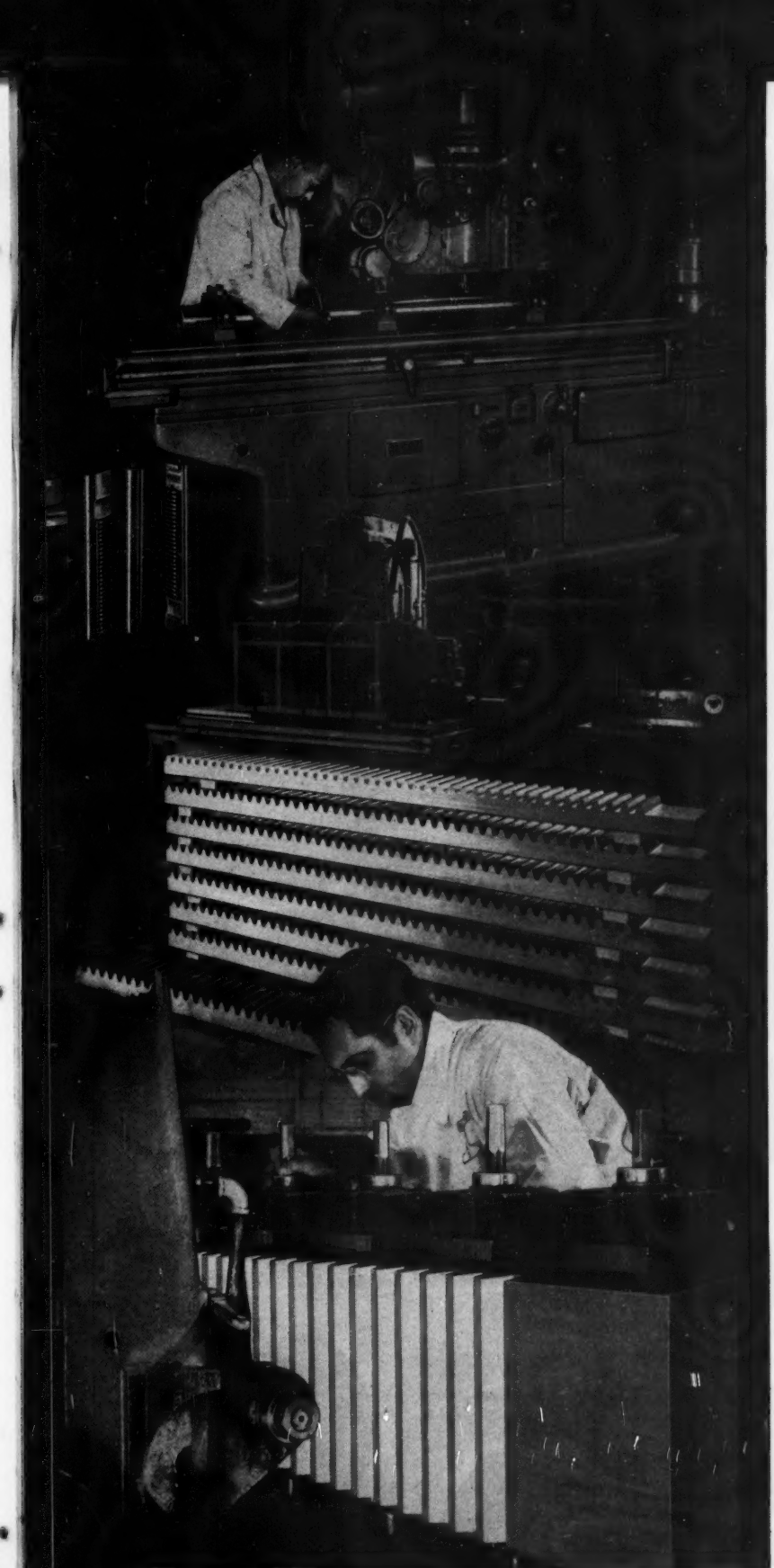

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LARGE... SMALL...
STRAIGHT...HELICAL
ANY SIZE...ANY TYPE
ANY MATERIAL

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Gears for Every Purpose ... one gear or 10,000 or more

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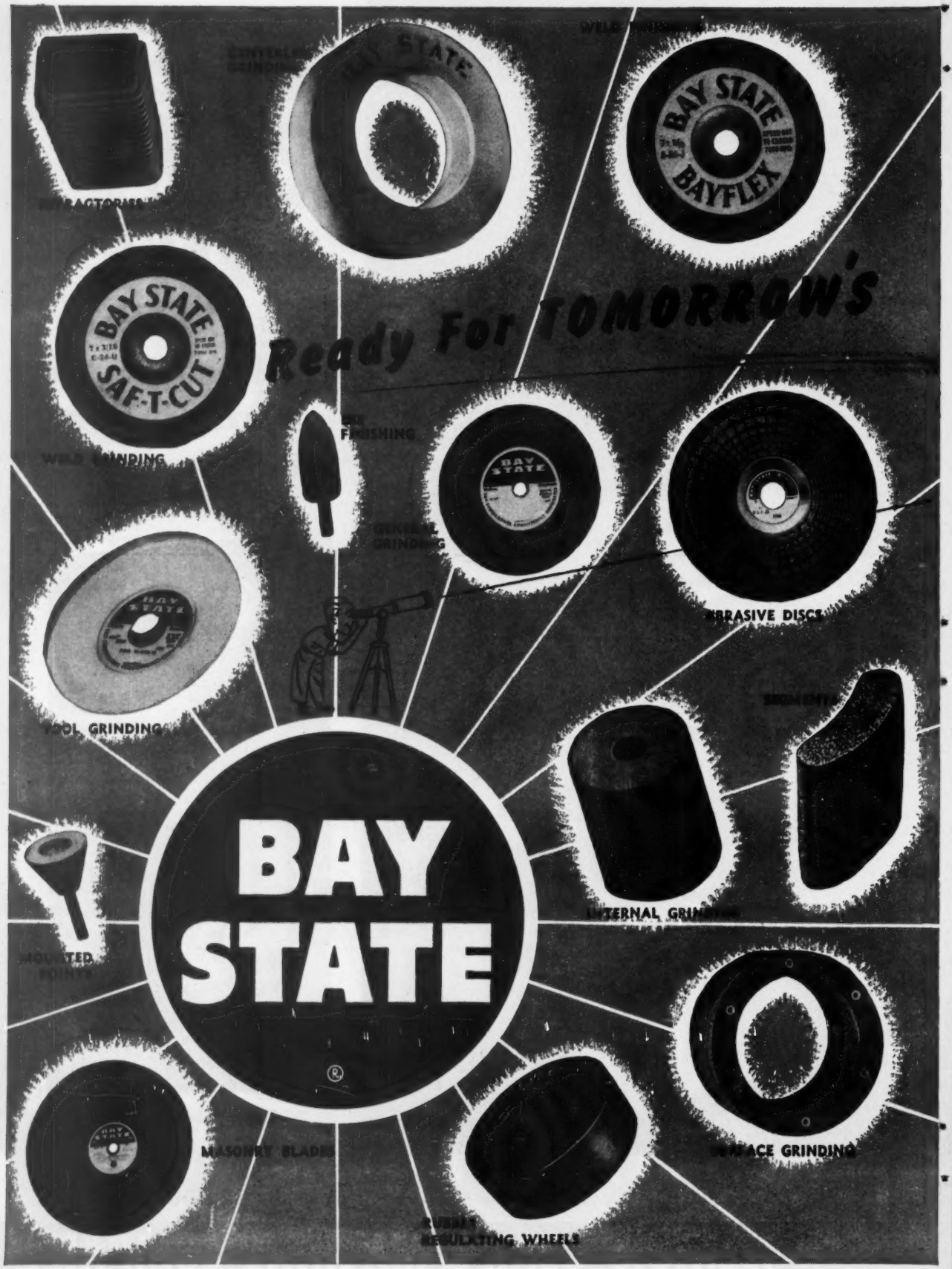
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Looking Ahead,

BAY STATE sees faster production speeds, more highly-specialized tools, tougher and harder alloys, still greater precision and finish requirements in grinding.

All these things, taken together, spell PROGRESS, and each one calls for BETTER GRINDING. That's where BAY STATE fits into the picture.

BAY STATE'S experienced personnel, advanced production and manufacturing techniques, CONTROLLED POROSITY, FRACTIONAL GRADES, modern equipment, extensive research . . . all are geared to that one purpose of bringing you BETTER GRINDING, through better abrasive products.

That's why in the future, as in the past, BAY STATE abrasive products will continue to set production records and bring profitable grinding to their users.

That's why you should let us show you what we mean when we say:

YOU CAN GRIND BETTER WITH BAY STATE

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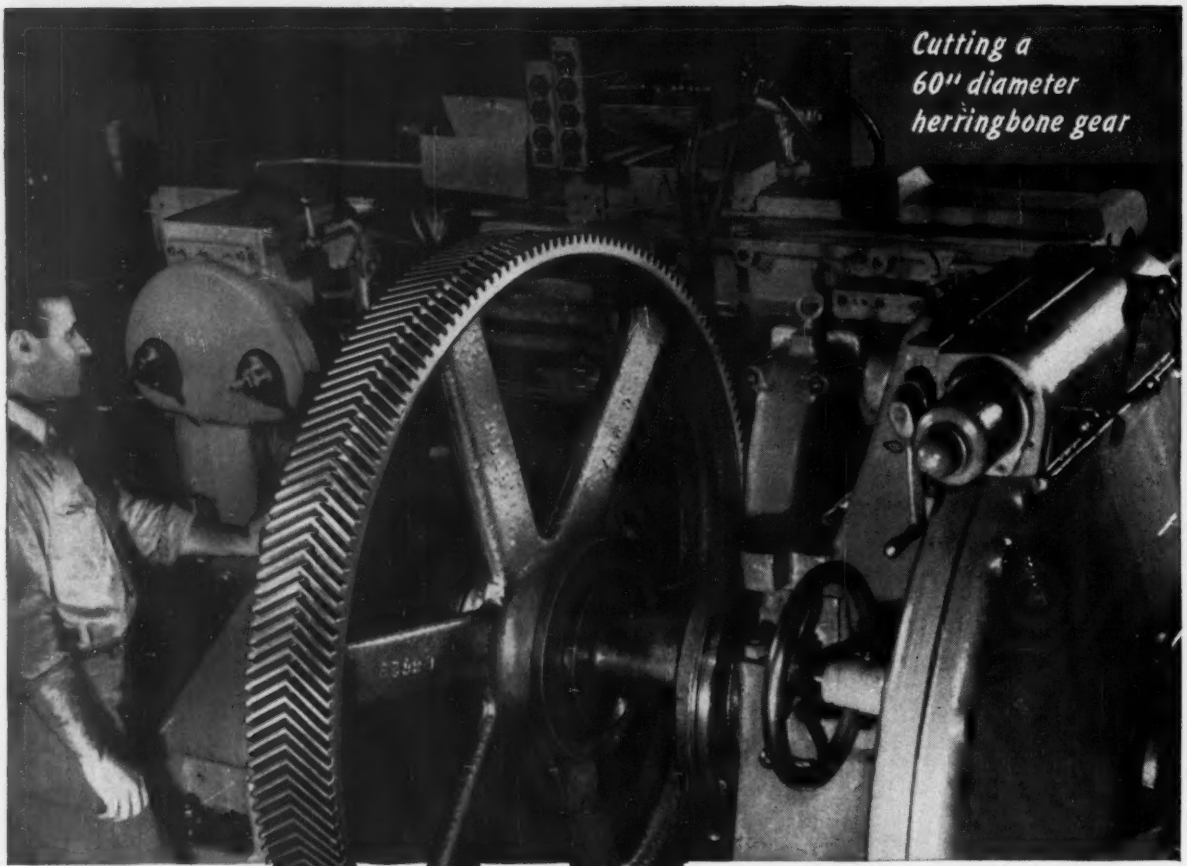
Branch Offices and Warehouses:
Chicago, Cleveland, Detroit, Pittsburgh
Distributors — All Principal Cities
In Canada: Bay State Abrasive Products Co. (Canada) Ltd., Brantford, Ont.



Cutting a 60" diameter herringbone gear

Herringbone gears

Cutting a big herringbone gear like this isn't particularly difficult —that is, if the right equipment and experienced operators are available. Here at BRAD FOOTE we have a happy combination of efficient machines and capable men to cut any size, any type, or any quantity of herringbone gears you might need.

• Then comes the finishing. Your specifications may call for heat-treating, flame or induction hardening, or perhaps shot-peening. All these and other special processes are available in BRAD FOOTE'S own shops. We control every operation on every gear, gearmotor, transmission, or assembly which you order from us. No one shares our responsibility.

• Close attention to details, complete manufacturing facilities, careful inspections, and strict adherence to specifications are your assurance of high quality in all BRAD FOOTE gears. So you can order with utmost confidence the gears you need for your own use or for resale on equipment you make for others.

• Next time you need gears, send us the specifications so we can quote you promptly.

BRAD FOOTE GEAR WORKS, INC.

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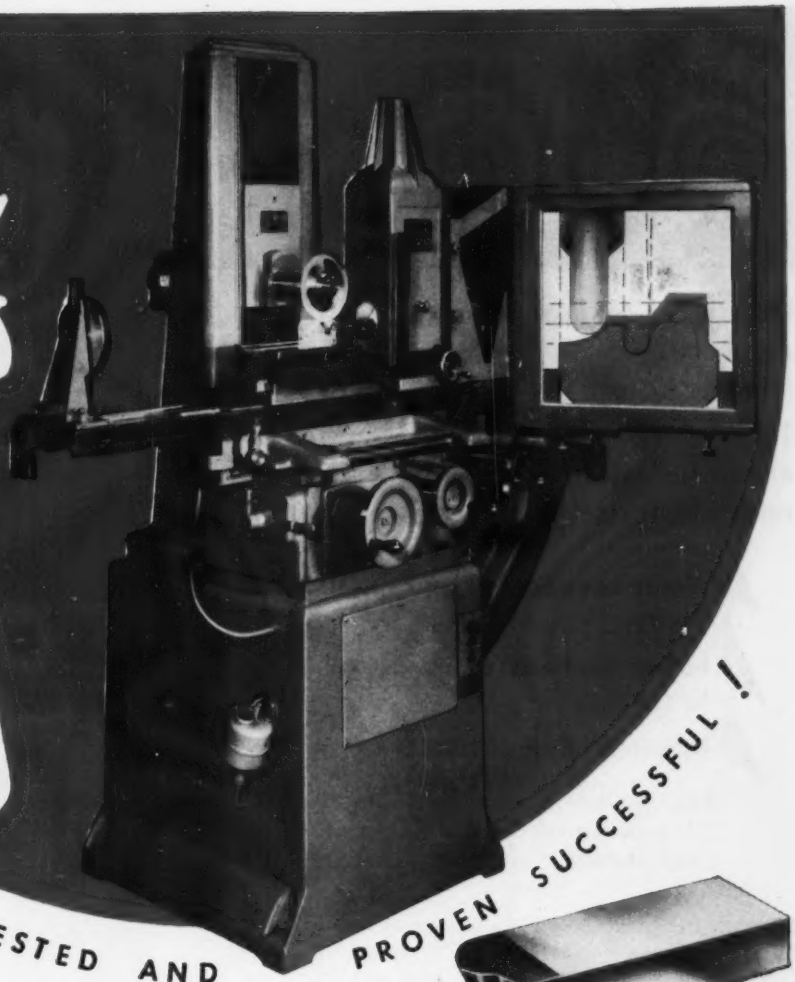
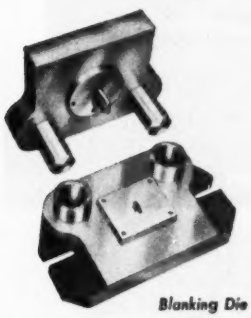
Positive Results with VISUAL GRIND

TRADE MARK



TESTED AND PROVEN SUCCESSFUL !

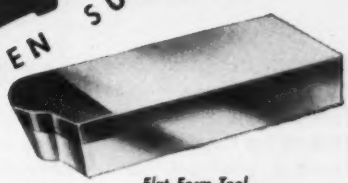
Progressive Die



Blanking Die

Here is precision contour grinding at its best. Steel and tungsten carbide form tools, die sections, templates and related items are efficiently processed in dependable, economical fashion. Our basic magnetic chuck work-holder affords positive positioning yet with flexibility for cam, circular and index grinding with the proper fixtures. Workpiece quality is controlled visually at all stages, either while using pre-dressed grinding wheels or when generating the required contour by means of successive, controlled movements. Durable construction around precision optics insures rigidity and long life.

Ask for Bulletin "M-4"



Flat Form Tool

Circular Form Tool

Dovetail Tool

VISUAL GRIND

THE CLEVELAND GRINDING MACHINE COMPANY

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New Possibilities in Optical Grinding

New Idea . . .

IN TESTING CASTINGS FOR LEAKS

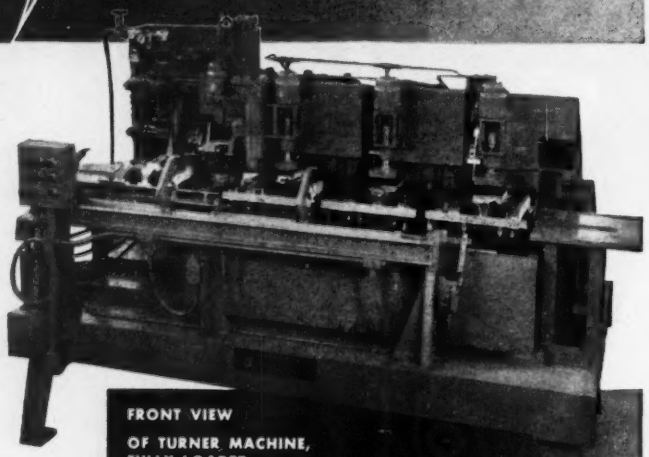
TURNER MACHINE PRESSURE TESTS AND ISOLATES THE LEAK AUTOMATICALLY!

Designed to leak-test manifold castings, or any other type of leak-proof castings.

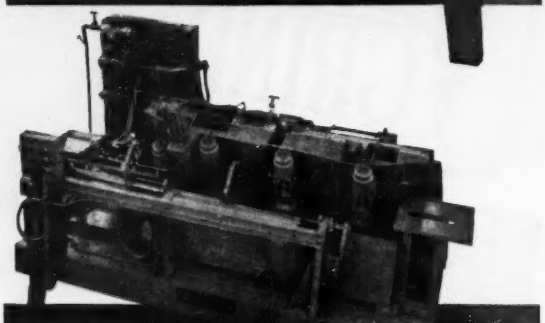
The Turner machine illustrated checks simultaneously at separate stations:

1. **Water connections and heating cavity.**
2. **Lower sections of intake cavities.**
3. **Upper section of intake cavity.**

And, any leak is isolated automatically! That's the big advantage over pressure gauge testers!



FRONT VIEW
OF TURNER MACHINE, FULLY LOADED



DOWN VIEW
SHOWS MANIFOLDS SUBMERGED IN 90 GAL. TANK

REAR VIEW
SHOWING GAUGE. AIR IS INTRODUCED AT 40 LBS. PRESSURE

Specially designed to save manpower as well as accurately test for casting leaks, the Turner machine performs each step automatically. The manifolds are picked up from the automation station, brought into loading position, then transferred to each testing station. When parts are in position in the fixtures, the machine clamps them into place and seals all openings. By means of air cylinders, the parts are then dropped into a 90 gal. water tank, deep enough to completely cover the parts. Remaining submerged for about 15 seconds which allows the operator ample time to detect and mark any leak. The head then automatically comes back to its original position and the transfer mechanism picks up another part . . . at the same time ejecting the checked part onto the automation system.

More accurate, and even more economical than other methods of checking casting leaks, the new Turner machine can be adapted to any type or size of similar leak-testing application. It's designed to help save manpower, inspection time and floor space . . . while increasing production!

If you have a production assembly or inspection problem where you can use to advantage a special purpose machine, write today describing your problem. After our engineering department analyzes it, our field engineer will discuss it with you.

TURNER BROS. INC.
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DESIGNERS and BUILDERS of:
- SPECIAL MACHINES
- JIGS and FIXTURES

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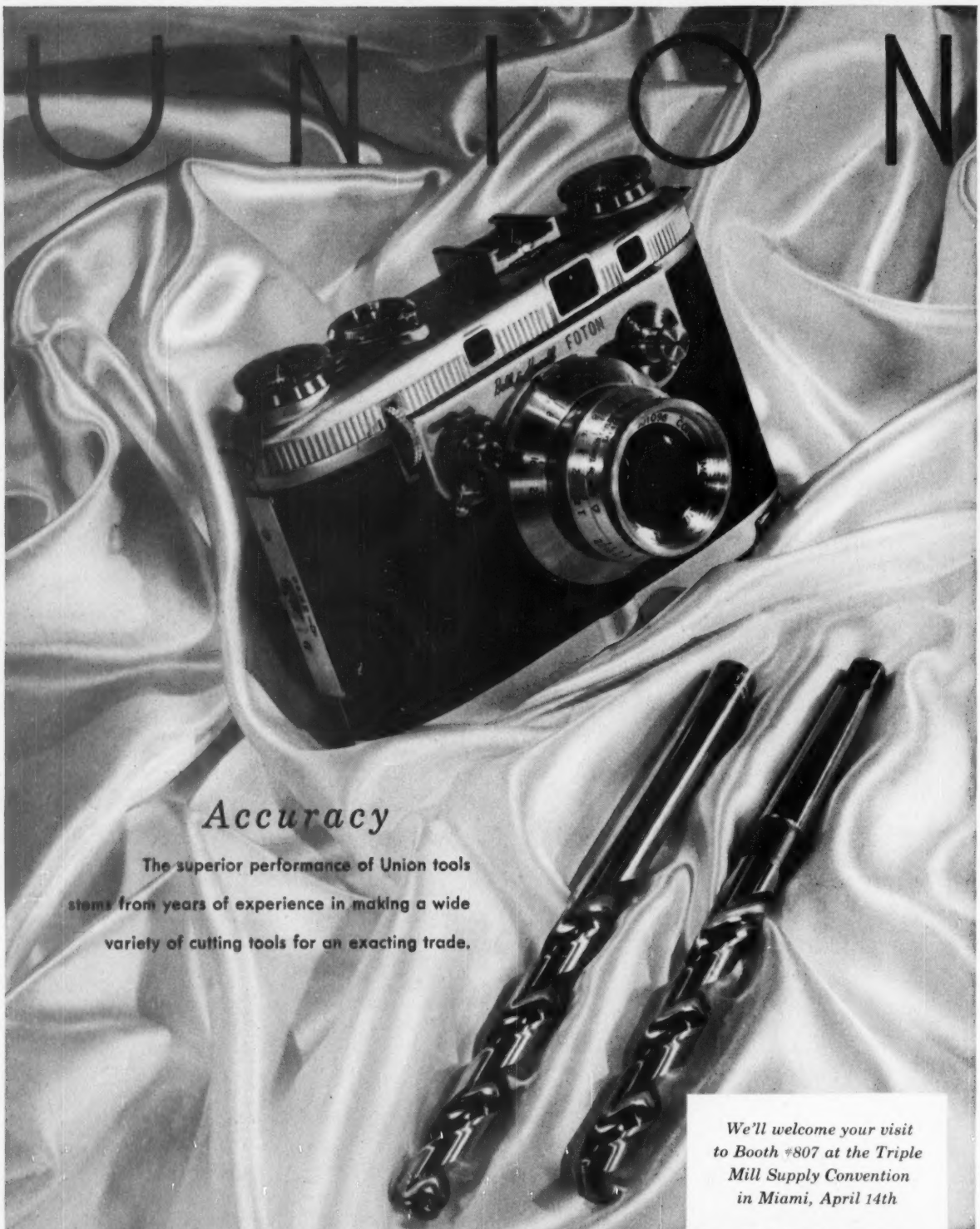
TAPS *by* CARD

Performance on the job **is what guides all Card manufacture. For generations, Card has had but one objective — to make the best taps money can buy.**

S. W. CARD MANUFACTURING CO., MANSFIELD, MASS. • DIVISION OF UNION TWIST DRILL CO. The CARD Quality **TAPS • DIES • SCREW PLATES**

UNION



Accuracy

The superior performance of Union tools stems from years of experience in making a wide variety of cutting tools for an exacting trade.

We'll welcome your visit to Booth #807 at the Triple Mill Supply Convention in Miami, April 14th

UNION TWIST DRILL COMPANY • ATHOL, MASSACHUSETTS

Milling Cutters Gear Cutters Twist Drills Hobs Reamers Carbide Tools

OWNERS AND OPERATORS OF: S. W. CARD MANUFACTURING CO. DIVISION, Mansfield, Mass.
BUTTERFIELD DIVISION, Derby Line, Vermont and Rock Island, Quebec

LIKE THE BAMBERGER-REINTHAL CORPORATION, CLEVELAND—YOU, TOO, CAN . . .

Modernize Your Equipment With New G-E Gear-motors

The Bamberger-Reinthal Corporation of Cleveland, Ohio recently converted to new G-E Gear-motors for machines knitting sweaters, shirts, stoles, and caps. Bamberger-Reinthal says: "These new G-E Gear-motors are much more efficient than our previous drive. They're the latest thing as far as we're concerned, and they're less expensive to operate and maintain."

G-E Gear-motors will modernize your operation too! Here's why:

G-E GEAR-MOTORS ARE COMPACT, requiring only a little more space than a regular constant-speed motor of the same rating. No external speed reduction equipment is necessary.

G-E GEAR-MOTORS ARE RUGGED. They're engineered to give you years of dependable service under the most severe operating conditions.

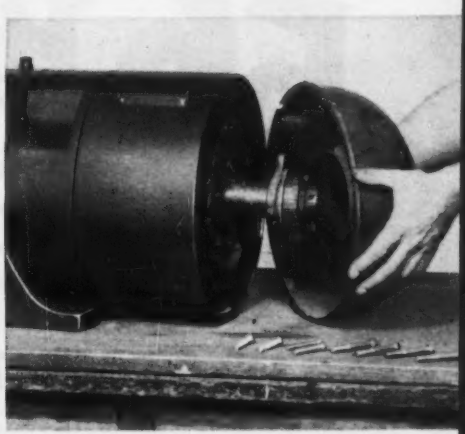
Assure yourself of getting the most efficient, easiest-to-maintain low-speed drive. Specify G-E Gear-motors.

A new stocking plan now makes one-week delivery available on over 300 models. Order your G-E Gear-motor through your nearest G.E. Apparatus Sales Office, or your Authorized G.E. Agent or Distributor. General Electric Co., Schenectady 5, N. Y. 735-11

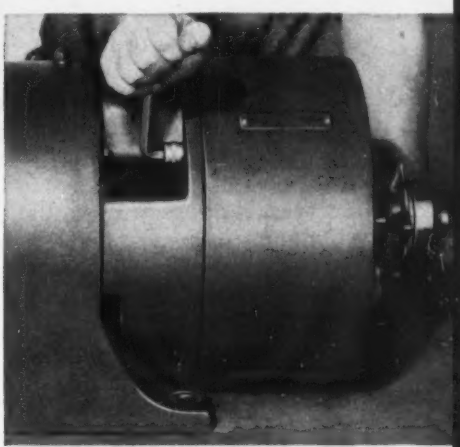
You can put your confidence in—

GENERAL ELECTRIC

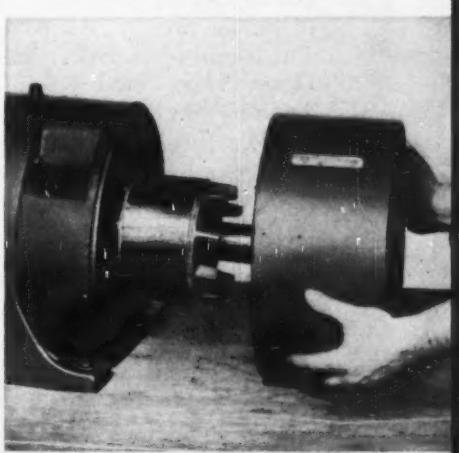
MAINTENANCE IS QUICK AND EASY



REMOVE ENDSHIELD FROM STATOR. If stator removal is required, it's never necessary to remove gear-motor from its foundation or disturb the gear train in any way.



UNBOLT STATOR FRAME BOLTS. Adapter located between motor frame and gear housing gives easy access to stator frame bolts. Note: no special tools are needed.

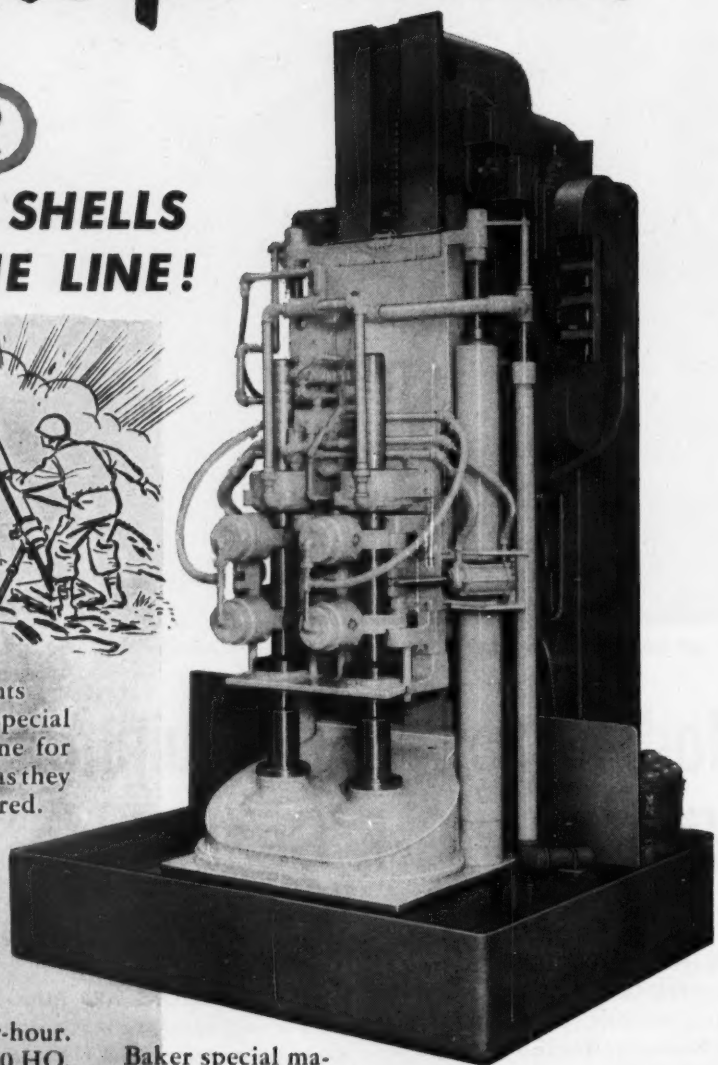


NOW THE STATOR MAY BE REMOVED. Entire job takes only minutes. This is only one of many features designed to cut "down time" up to 50 per cent.

56 Parts per hour...

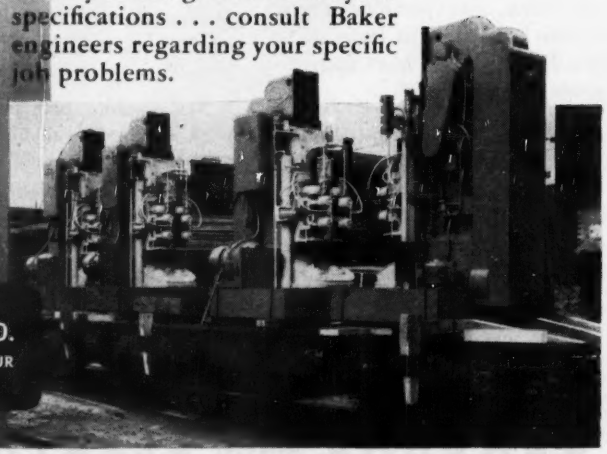
BAKER KEEPS MORTAR SHELLS ROLLING OFF THE LINE!

Better machine tools are the bulwark of American defense. Today, from coast-to-coast, Baker special machines are hard at work increasing production figures in the manufacturing plants across the nation... New Baker special machines are rolling off the line for even greater productivity, as fast as they can be designed and manufactured.



Increased production is attained in boring and counterboring operations on 4.2 inch chemical mortar shells with Baker special machines. Rate of production . . . 56 parts-per-hour. The machine . . . Baker Model 30 HO. Heavy Duty Two Spindle Inverted Type Hydraulic Feed High Speed Boring Machine. The operations... chucking two shells; locating shells over spindles from fixed vee blocks, one each at upper and lower end of each shell; bore 3.75" diameter hole to 15 inch depth of cut; counterbore 3.74" diameter hole to 7/16 inch depth of cut.

Baker special machinery is designed to meet your specifications . . . consult Baker engineers regarding your specific job problems.

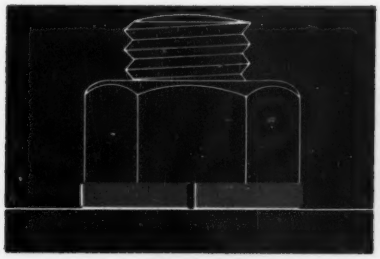


BAKER BROTHERS Inc., Toledo, O.

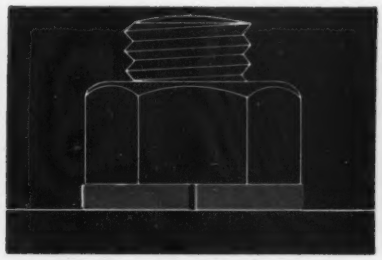
DRILLING, BORING, TAPPING, KEYSEATING AND CONTOUR GRINDING MACHINES

This time-tested principle still keeps

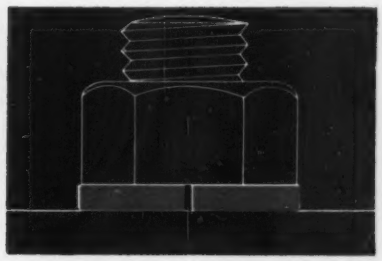
bolted assemblies tighter longer — at less cost



Against wear



Against vibration



Against bolt elongation

Reliance SPRING LOCK WASHERS

Bolted assemblies, in most instances, are no better than the spring lock washers that keep them tight. Wear, vibration and bolt elongation create looseness in bolted assembled parts.

Reliance Spring Lock Washers are helical coil in design, fabricated from spring steel and will maintain maximum reactive tension to keep thread seated tightly against thread reducing the possibility of looseness due to vibration and wear. The wide reactive range of Reliance Spring Lock Washers compensates for looseness created by bolt elongation and keeps the bolted assembly tighter longer, effectively reducing costs and providing product safety. Specify Reliance Spring Lock Washers on your next production job—there is a size and type to fit all requirements.

SEND FOR FREE ENGINEERING LITERATURE W-50

This new 36 page book, packed with information on Reliance Spring Lock Washers is yours for the asking. You'll find it helpful in planning future production line economies. Send for it today.

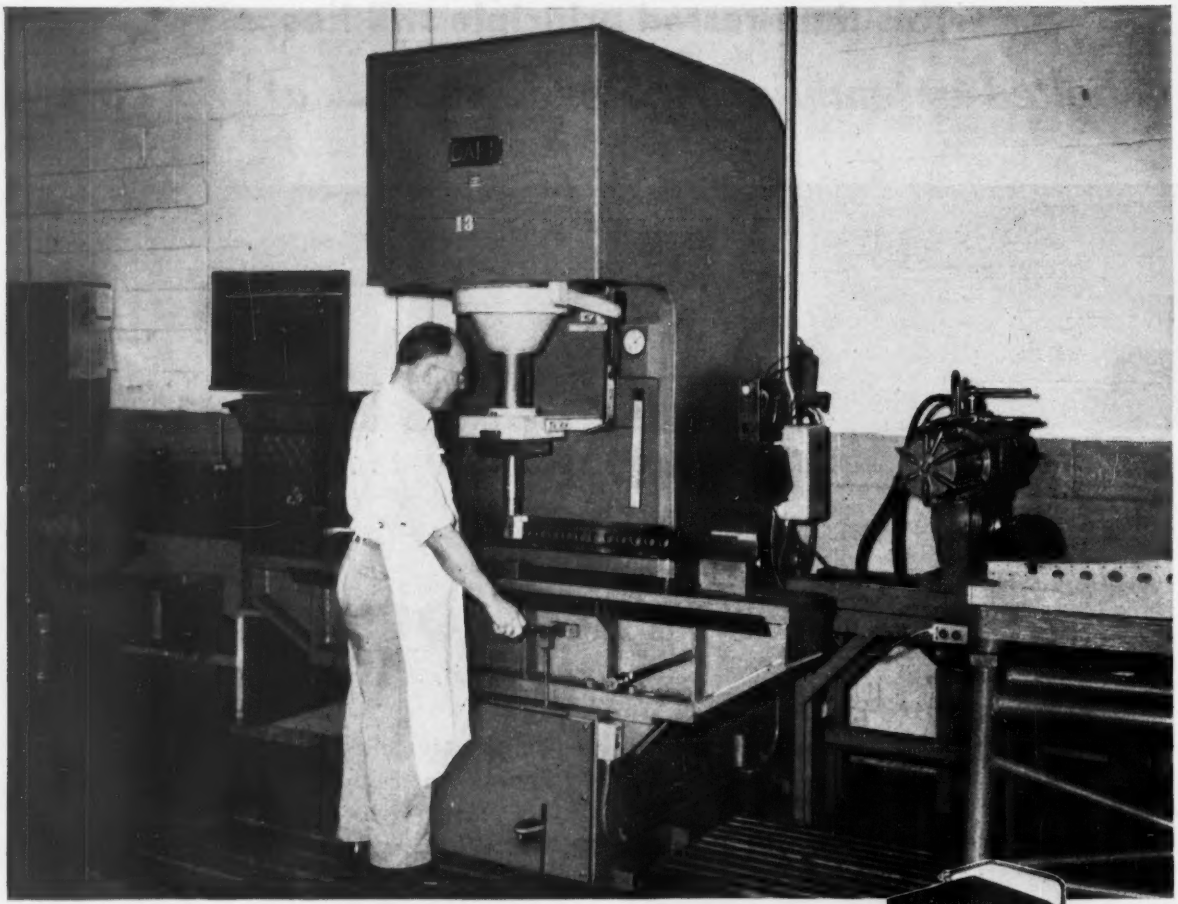
RELIANCE DIVISION

EATON MANUFACTURING COMPANY

OFFICE and PLANTS: 507 Charles Ave., S.E., MASSILLON, OHIO

Springtites & Seams · Snap & Retaining Rings · Special Steels in bar, rod or coils · Spring Lock Washers · Hex-Fas-Ner

SALES OFFICES: New York • Cleveland • Detroit • Chicago • St. Louis • San Francisco • Montreal



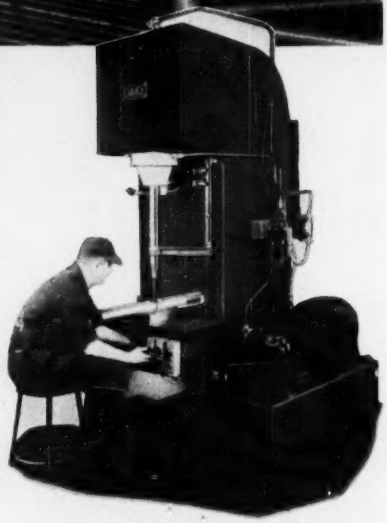
How to Straighten Flap Tracks

Precision parts for aircraft call for the use of precision equipment.

These flap tracks, machined from 4130 steel (aircraft quality), must be checked on a straightening press four times during fabrication. For ease of control and accuracy, the work is done on Dake Gap Type Presses like that shown above.

To the right of the ram, the operator has placed a rule gauge which indicates ram travel. Knowing the elasticity of the piece being tested, he can estimate the overtravel necessary to straighten the piece with a single movement of the ram.

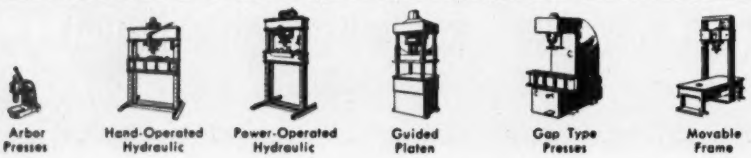
Dake Gap Type Presses are available for straightening or forcing, in 22 models ranging up to 300 tons capacity. They are fully described in Bulletin No. 299 —sent on request.



This Dake Gap Type Press is used for broaching boring bars

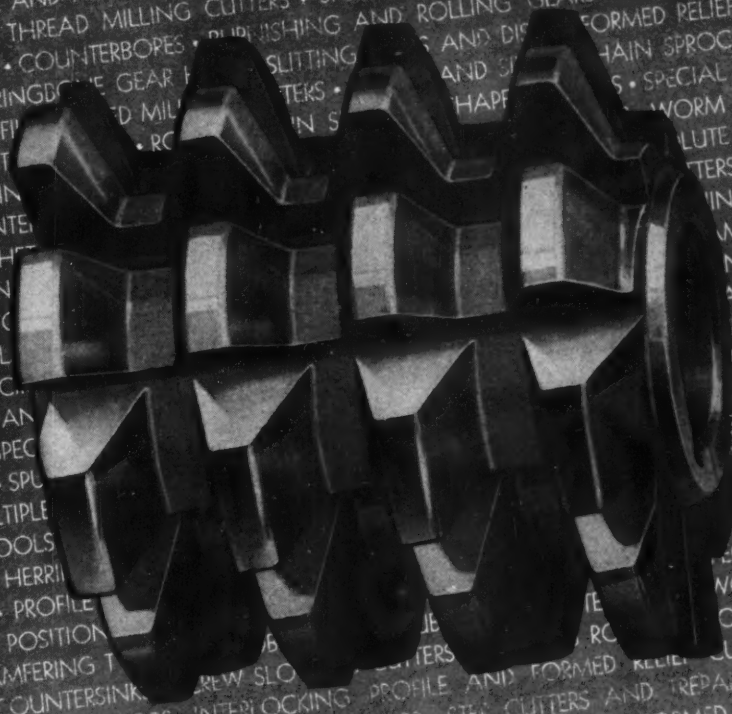
Dake Engine Company, 604 Seventh St., Grand Haven, Mich.

DAKE PRESSES



FOR THOSE TOUGH Special TOOLS

National Tool Co.



● **Years of successful experience in *special* tooling and related production problems are yours for the asking. When the job requires *special* cutting tools call in your National Tool Co. representative. He is backed by more than 46 years experience in the engineering and manufacture of *special* cutting tools. His assistance is yours, without obligation, whether you're interested in one tool or a complete tooling program.**

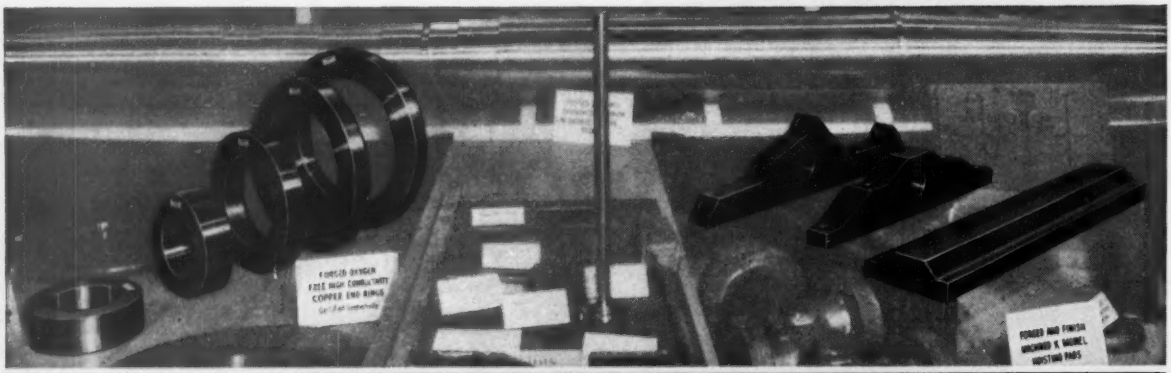
Since 1905 **engineers and manufacturers of high-quality special cutting tools for the metal-working industry**

National Tools Cleveland

National
TOOL CO.
Cleveland 2, Ohio

Versatility Counts—

THESE *FORGINGS* DONE ON A NAZEL ELECTRO-PNEUMATIC



Forgings shown at top, left, are oxygen-free high conductivity copper end rings; those at right are finish machined K Monel Hoisting pads . . . these Forgings readily produced on a NAZEL Electro-Pneumatic Hammer by Philadelphia Bronze & Brass Corp. . . . and as displayed at the National Metal Exposition, October, 1952, Philadelphia.

Hammer, Air Compressor and Electric Motor are "all one" — therefore, the NAZEL requires no boilers, compressors, tanks, piping, fuel, ash handling, shafting, pulleys, hangers, etc.

The NAZEL Hammer can be started or stopped at the mere push of a button, and it uses power only when working (think what this means in comparison with other types of hammers).

Low upkeep cost and high efficiency are outstanding features of the NAZEL.

To meet Industry's varied Forging Requirements . . . we produce the NAZEL Hammer in 5 different types and 16 sizes . . . forging steel billets up to 12" x 12".

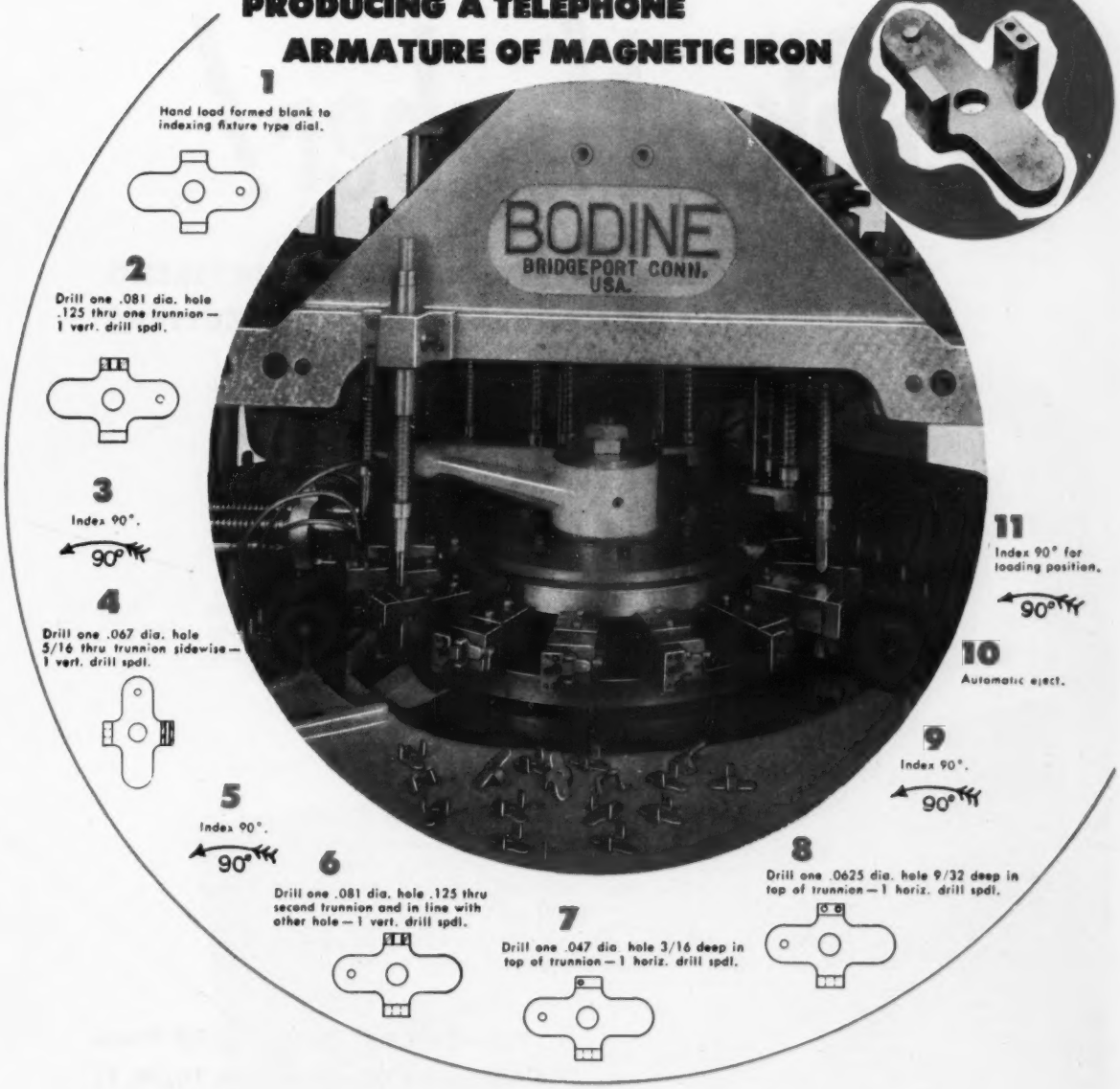
1836 **LOBDELL UNITED COMPANY** 1953

WILMINGTON 99, DELAWARE

A SUBSIDIARY OF UNITED ENGINEERING AND FOUNDRY COMPANY

Bodine CASE HISTORY NO. 34

PRODUCING A TELEPHONE ARMATURE OF MAGNETIC IRON


1
Hand load formed blank to indexing fixture type dial.
2
Drill one .081 dia. hole .125 thru one trunnion — 1 vert. drill spdl.
3
Index 90°.
90°
4
Drill one .067 dia. hole 5/16 thru trunnion sidewise — 1 vert. drill spdl.
5
Index 90°.
90°
6
Drill one .081 dia. hole .125 thru second trunnion and in line with other hole — 1 vert. drill spdl.
7
Drill one .047 dia. hole 3/16 deep in top of trunnion — 1 horiz. drill spdl.
8
Drill one .0625 dia. hole 9/32 deep in top of trunnion — 1 horiz. drill spdl.
9
Index 90°.
90°
10
Automatic eject.
11
Index 90° for loading position.
90°
BODINE
BRIDGEPORT CONN. USA.

PRODUCTION: The Bodine 42-30 automatic horizontal dial type of machine (one of 6 standard sizes) is equipped with 5 drill spindles (3 vertical, 2 horizontal) and special fixtures which automatically index the work 90° four times during the cycle. Production: 500 pieces (2500 operations) per 50-minute hour at 10 strokes per minute.

ACCURACY: *Alignment of two .081 dia. holes ±.002; other hole locations to within 010, hole diameters held to ±.002.*

WRITE FOR INFORMATION *on high-speed repetitive production with combinations of drilling, tapping, milling, screw inserting, staking, and assembly.*

18D53

"You Can't Meet Tomorrow's Competition with Yesterday's Machine Tools."

THE
Bodine
CORPORATION
BRIDGEPORT 5, CONNECTICUT

AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES

Lucky Number!

FOR METALWORKING ENGINEERING AND MANUFACTURING EXECUTIVES

MACHINERY FOR JULY will feature the latest advances in manufacturing methods developed by the Aircraft Industry.

The wealth of usable, well-authenticated information, stemming from the inventiveness and resourcefulness of this fast-moving industry, will have a marked effect on metalworking techniques. Many of the methods developed in aircraft plants can be employed or adapted to other fields . . . for the production of almost anything made of metal . . . for defense as well as for the goal of world peace.

Contents of such vital importance will meet with enthusiastic response, not only from aircraft engineers, but from engineering and manufacturing executives in all branches of metalworking.

LUCKY NUMBER FOR ADVERTISERS, TOO

MACHINERY'S 13th Aircraft Production Number will be read by the metalworking executives most interested in advanced production methods—the men who actually control the purchase of the equipment and materials used in every step in the manufacture of every kind of metal product.

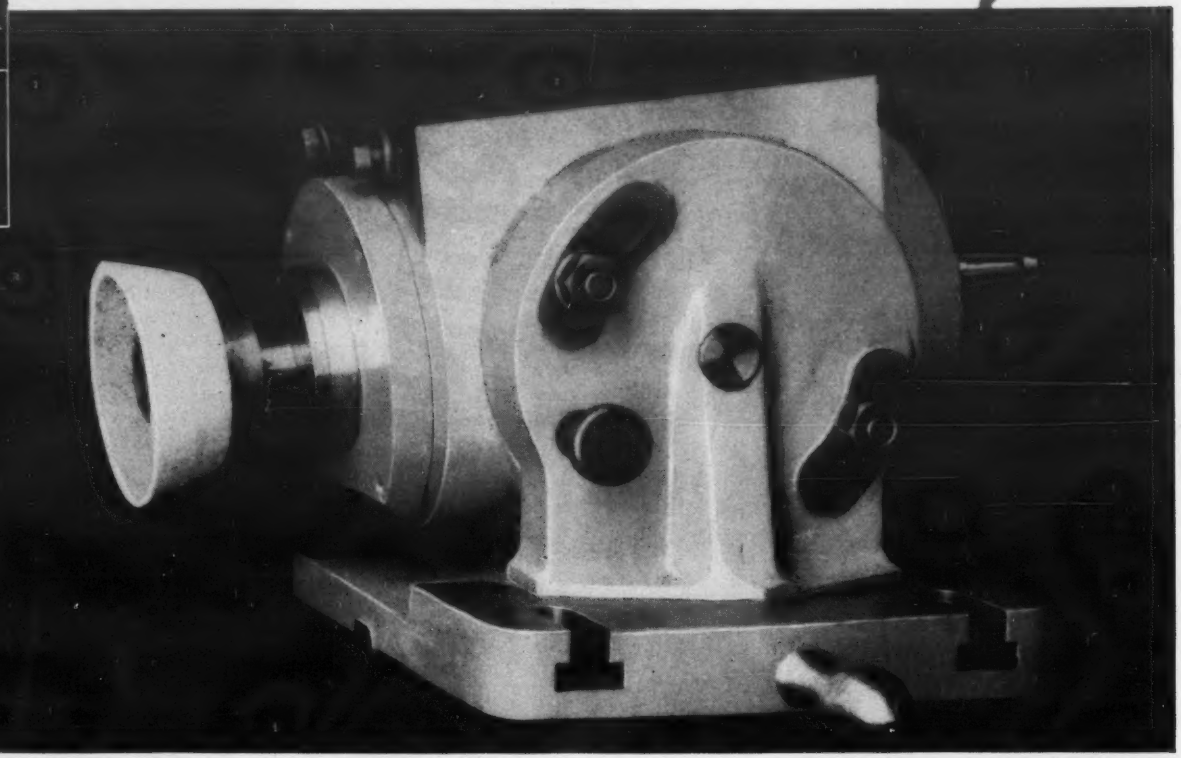
Knowing this, wise advertisers will see to it that MACHINERY FOR JULY is definitely on the schedule. Forms close June 5th.

Published by The Industrial Press
148 Lafayette St., New York 13, N. Y.

MACHINERY'S 13TH

MACHINERY
METALWORKING'S MONTHLY MAGAZINE OF ENGINEERING AND PRODUCTION
AIRCRAFT PRODUCTION NUMBER — JULY
NBP
ABC
CCA

The TOOL GRINDER For *You!*



The Modern POPE Super Precision 1 HP, 3600 RPM Motorized Tool and Cutter Grinder Head With Angular Adjustment In A Vertical Plane

This new unit is super-precision throughout... It is designed particularly for replacement of tool grinder heads which do not have the extremely useful angular adjustment in a vertical plane.

It will more than pay for itself — reduces set-up time — makes wheels cut faster — spark out quicker — produces the kind of cutting edge on your tools that stands up and cuts longer.

Pope Motorized Grinder Heads are available for most makes of cutter and tool grinders. Ask for quotation to cover *your* grinder.

No. 92

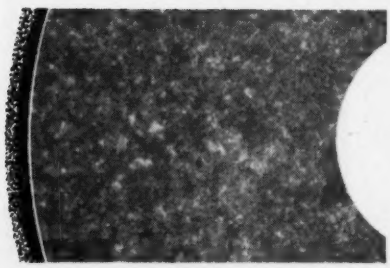
Specify **POPE** PRECISION SPINDLES

POPE MACHINERY CORPORATION
Established 1920
261 RIVER STREET • HAVERHILL, MASSACHUSETTS

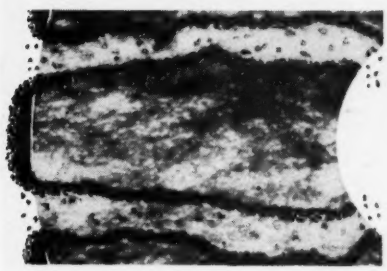
GRADUATED DENSITY

makes MICRO-KLEAN the most effective filter on the market!

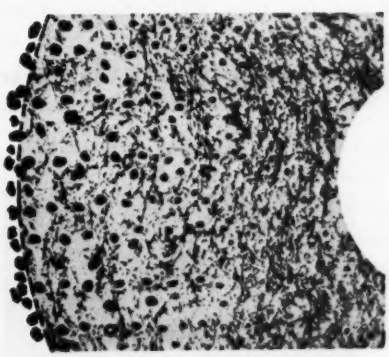
How MICRO-KLEAN compares with other cartridge filters



Compare **MICRO-KLEAN with FILTERS WITH THE SAME DENSITY THROUGHOUT.** The filter media density is the same on the pressure and discharge surfaces of the element; therefore, dirt accumulation is largely on the outside surface, choking the cartridge ("plastering") and reducing the effective filter life.



Compare **MICRO-KLEAN with FILTERS WITH HAPHAZARD DISTRIBUTION OF FILTER MEDIA.** Uneven haphazard media density permits fluid to find channels through the filter, and pass solids larger than the minimum filter spacing.



Now Look **at the advantages offered by MICRO-KLEAN.** See how the fibre density increases toward the discharge side of the MICRO-KLEAN filter cartridge? In effect, every Cuno MICRO-KLEAN cartridge is an infinite multiplicity of screens, ranging from relatively coarse on the outside down to 10 microns in the center. Because of MICRO-KLEAN's graduated density in depth, particles are entrapped within the entire depth of the filter element, giving the cartridge a much longer effective life. Standard cartridge size is 9¾" long by 2¾" O. D., in densities of 10, 25 and 50 microns.

MICRO-KLEAN gives you

- **greater dirt holding capacity**
- **absolute protection against rupturing or channeling of the cartridge**
- **longer effective cartridge life**

REMEMBER . . . IF YOU CAN PUMP IT, CUNO CAN FILTER IT

M.3.C

CUNO

ENGINEERED FILTRATION

Removes More Sizes of Solids From More Kinds of Fluids

AUTO-KLEAN (disc-type) • MICRO-KLEAN (fibre cartridge) • FLO-KLEAN (wire-wound)

COMPACT, FULL-FLOW FILTRATION FOR INDUSTRIAL FLUIDS

Fewer Cartridge Changes Necessary with MICRO-KLEAN filters

You don't need a complicated, bulky filter to keep contaminants out of your chemicals, water, lube or fuel oils. Cuno MICRO-KLEAN's compact construction gives you full-flow filtration in space which would limit ordinary filters to by-pass service.

The high porosity and low pressure drop operation of MICRO-KLEAN filters permit this full-flow service on gravity, low pressure, or suction lines—with no loss in operating efficiency.

Cartridge replacement costs are generally cut in half when MICRO-KLEANS are used. MICRO-KLEAN's graduated density-in-depth provides much greater capacity for dirt accumulation within the micronic cartridge, giving twice the useful life of an ordinary filter element.

Cuno's exclusive method of felting fibres produces a cartridge of great structural strength, free from channeling or distortion and entirely unaffected by moisture or acids. And changing cartridges can be accomplished in a few seconds—only one nut has to be removed.

Send for Cuno's free filtration analysis form, have one of your engineers fill it out, and mail it to us. We'll let you know exactly what you need for your filtration requirements—without obligation. And take advantage of Cuno's unique "money-back" offer. If MICRO-KLEAN doesn't outperform any filter cartridge you have previously used, we'll send you *double* your money back. Send the coupon today for free MICRO-KLEAN bulletin.

M.3.5

Cuno Engineering Corporation
Dept. 135-C, South Vine Street, Meriden, Conn.

I'm interested in your "money-back" offer. Please send me your filtration analysis form—and more information on MICRO-KLEAN for

..... (fluid)

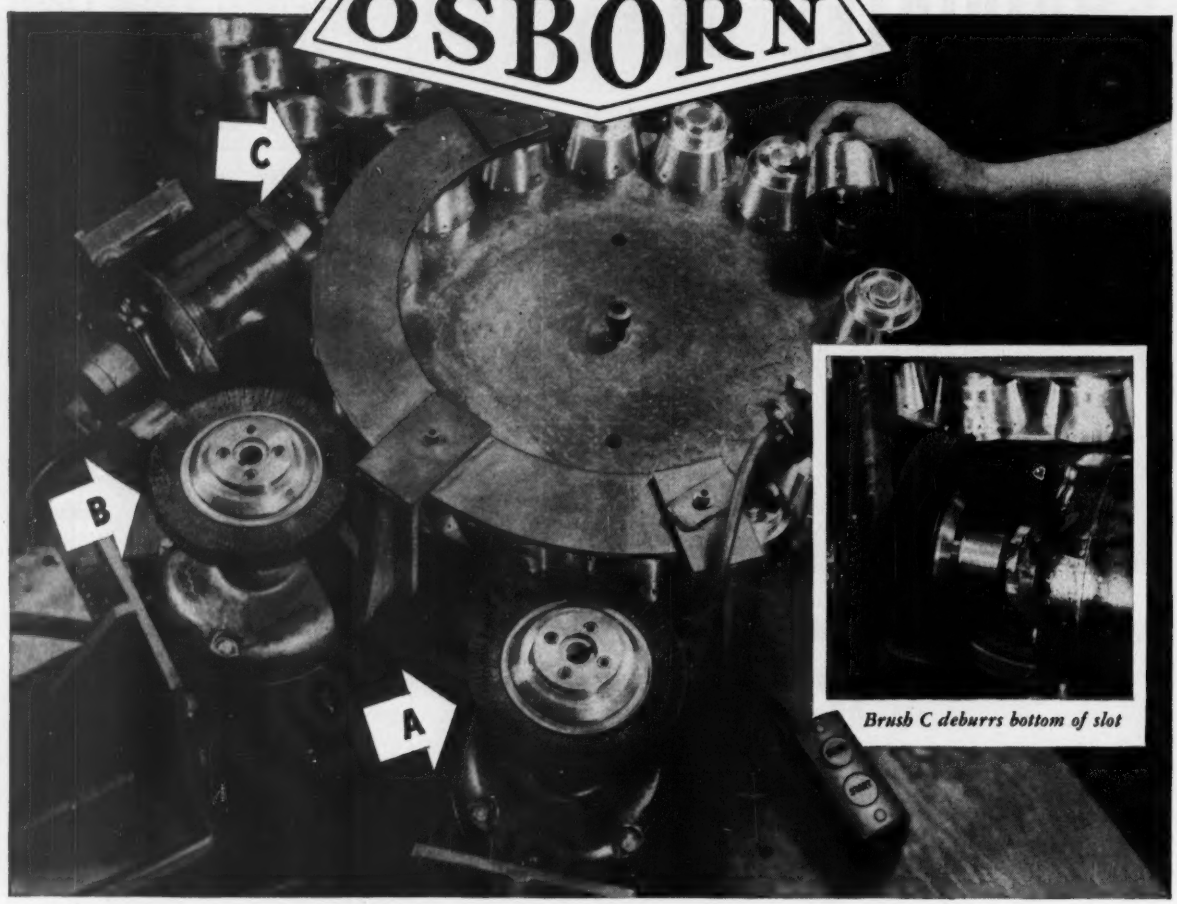
Name.....

Company.....

Address.....

City.....Zone....State.....

OSBORN



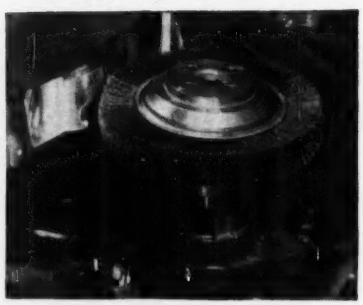
Brush C deburrs bottom of slot

Push-button brushing deburrs 1400 parts per hour

The Problem here was to remove feather burrs from a machined slot in aluminum ammunition components . . . *fast.* By a hand method, *output was only 360 per hour* and results were not uniform.

With the help of the **O**sborn **B**rushing **A**nalyst, the company built the rotating fixture shown above, equipped with three Osborn Master® Wheel brushes. Parts are placed on pins on clockwise-rotating table. Brush A, rotating clockwise, deburrs the corner of one side of slot. Brush B, rotating counterclockwise, deburrs the other side corner. Brush C deburrs the bottom corner. Slots come clean and smooth . . . *at a rate of 1400 per hour!*

Find out how power brushing can improve *your* product deburring, cleaning and finishing! Call the **OBA** or write *The Osborn Manufacturing Company, Dept. D-4, 5401 Hamilton Avenue, Cleveland 14, Ohio.*



Brushes A and B deburr side corners. Brushes rotate at 3450 rpm.

Osborn Brushes

OSBORN POWER, MAINTENANCE AND PAINT BRUSHES AND FOUNDRY MOLDING MACHINES

Cold Forging...

. . . THE COST-SAVING SOLUTION . . . . . FOR PARTS LIKE THESE

Did you know that many parts such as those pictured can be cold forged?

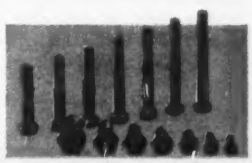
Through engineering and production methods which Allied employs, special cold forged parts can be produced in many unusual forms and sizes. In numerous instances, parts never before considered for this type of production have been manufactured by Allied.

Tolerances as close as are required for most machined parts can be secured. Cold forging processes invariably provide greater strength and durability in the parts produced. Of most importance, in high volume production, your part costs can be reduced considerably.

Send your part prints to learn what Allied can do for you.

Other Allied Products

HARDENED AND PRECISION GROUND PARTS • SHEET METAL DIES FROM THE LARGEST TO THE SMALLEST • ALLITE (ZINC ALLOY) AND PLASTIC DIES • JIGS • FIXTURES • R-B INTERCHANGEABLE PUNCHES AND DIES



STANDARD HEXAGON HEAD CAP SCREWS

Also produced in Allied's Plant 1 are standard hexagon head cap screws. They are of uniformly high quality and are priced competitively. Your inquiries concerning these products will receive prompt attention.

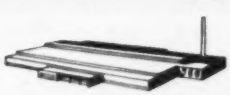
PRECISION • EXPERIENCE • ALLIED CORPORATION PRODUCTS • DEPENDABILITY

ALLIED PRODUCTS CORPORATION

DEPT. D-11 • 12619 BURT ROAD • DETROIT 23, MICH.

PLANT 1
Detroit, Mich.

PLANT 2
Detroit, Mich.



PLANT 3
Hillsdale, Mich.

PLANT 4
Hillsdale, Mich.

VK HIGH SPEED STEEL THREAD MEASURING WIRES

...basic tools in a universally accepted method of checking screw threads

VK Set No. 20 HS Thread Measuring Wires, accurate to ±.000025" for 20 common pitch Unified and American screw threads, 6 to 36 threads per inch.

The three-wire method is probably the best known and most widely accepted system of measuring pitch diameter of screw threads. Equipment required includes only a set of VK Thread Measuring Wires of proper diameter and an accurate measuring instrument.

Van Keuren Thread Measuring Wires have been developed over a period of many years of pioneering in the precise measurement field. They are made to National Bureau of Standards specifications, are held within .00002" for roundness, straightness and identity and to within .000025" of exact size.

VK Thread Measuring Wires are made of long-wearing, tough and beautifully finished high speed steel and are either 1-7/8" or 2" in length. Every wire is subjected to the closest criteria in today's standards of accuracy.

In addition to set No. 20, shown here, VK furnishes many other standard sets as well as special wires in diameters from .001" to 1.500".

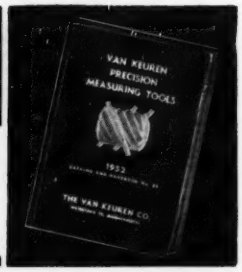
The Van Keuren Catalog and Handbook No. 35 contains 91 pages of technical and engineering information on wire measurement of screw threads. This information, compiled from many years' research in the field, is available without charge by addressing: The Van Keuren Co., 178 Waltham Street, Watertown, Mass.

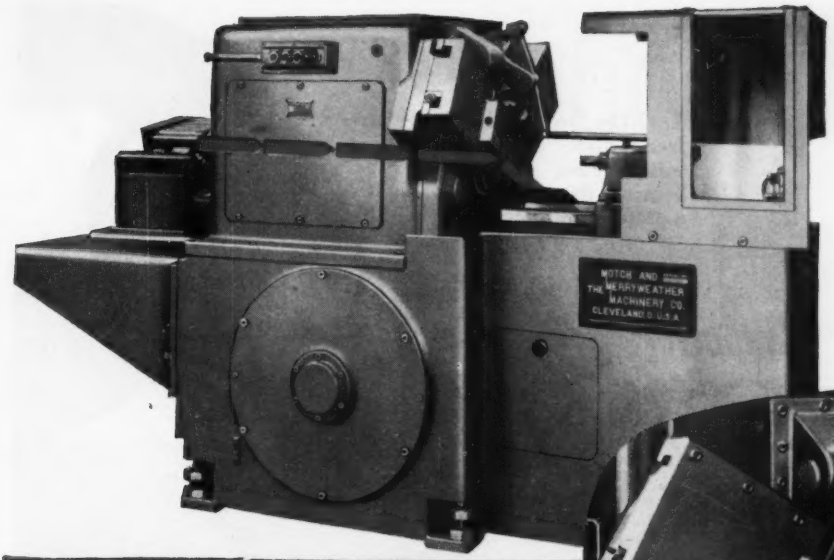
VK 34th YEAR

THE Van Keuren CO.

178 WALTHAM STREET, WATERTOWN, MASS.

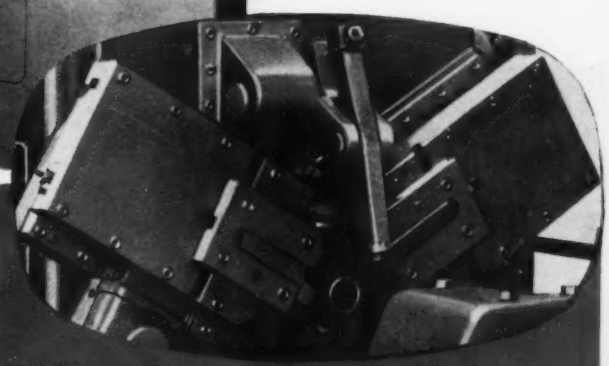
Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Cemented Carbide Plug Gages • Carboloy Cemented Carbide Measuring Wires





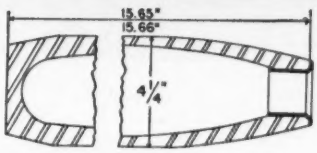
MP/SF
Most Production per Square Foot

Conveyor carries shells to hopper. Shells are fed automatically through hollow spindle, machined and ejected onto conveyor.

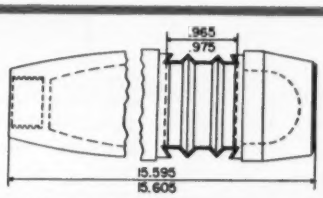


MOTCH & MERRYWEATHER *Automatics* make the most of AUTOMATION

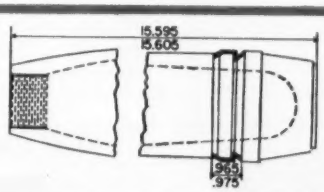
Material: shell steel SAE 1050.
Operation: bore, face, chamfer (nose end)
Estimated Production: 220 pcs/hr. @ 100%.



Material: shell steel SAE 1050.
Operation: face base, turn band groove and band relief.
Estimated Production: 120 pcs/hr. @ 100%.



Material: shell rotating band.
Operation: turn band.
Estimated Production: 220 pcs/hr. @ 100%.



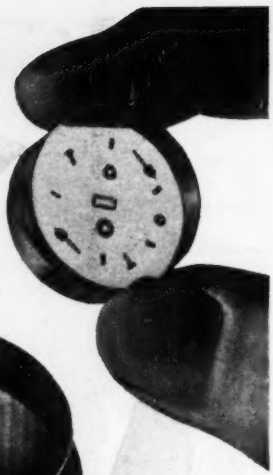
This single-spindle, form-turning automatic, developed for civilian production, has been assigned to much heavy duty munition work. Loading, positioning and unloading are completely automatic. All functions are actuated by hardened cams. With operator fatigue eliminated, one man can service several machines.

Manufactured by — THE MOTCH & MERRYWEATHER MACHINERY CO. —
CLEVELAND 13, OHIO
Builders of Circular Sawing Equipment, Production Milling, Turning and Special Machines

PRODUCTION-WITH-ACCURACY MACHINES AND EQUIPMENT

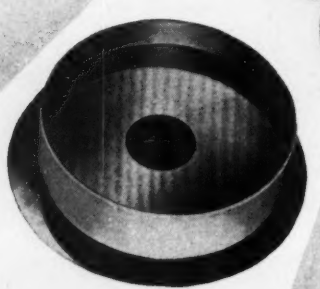
Tiny?

Yes! The No. 11 Blanchard Surface Grinder grinds these ladies' watch gears, pinions and ruby bearings flat and parallel, and to a dimension tolerance of .0002".



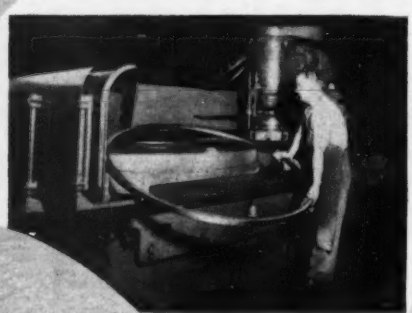
Smooth?

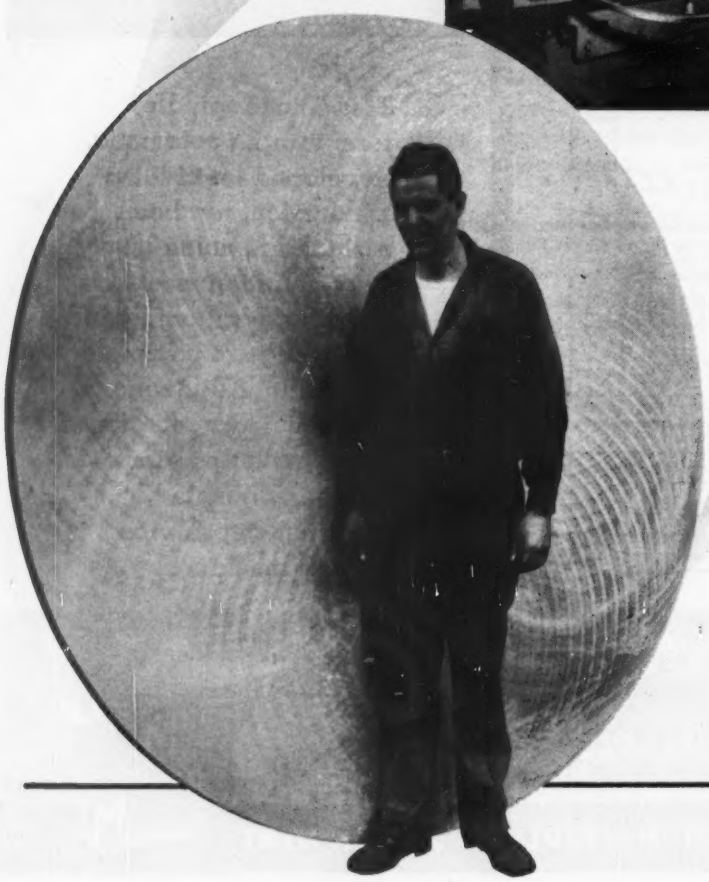
Of course! The Blanchard No. 11 finished this refrigerator plate, seen through an optical flat, to 3 micro inches and flat within 1 light band (.0000118").



Accurate?

Sure . . . and easy, too! This Blanchard grinds 84" forged steel rings flat within .0002", parallel to .0002", dimension tolerance of ±.0005", and with surface finish of 4 micro inches.





Tremendous?

Yes . . . but fast! This 88" diameter cast-iron plate was ground on a No. 42-72-84 Blanchard in 3½ hrs., floor to floor. ¼" of stock—1520 cu. in.—380 lbs. was removed.

If you produce flat surfaces, your best bet is Blanchard Grinders—with Blanchard Wheels!

PUT IT ON THE BLANCHARD

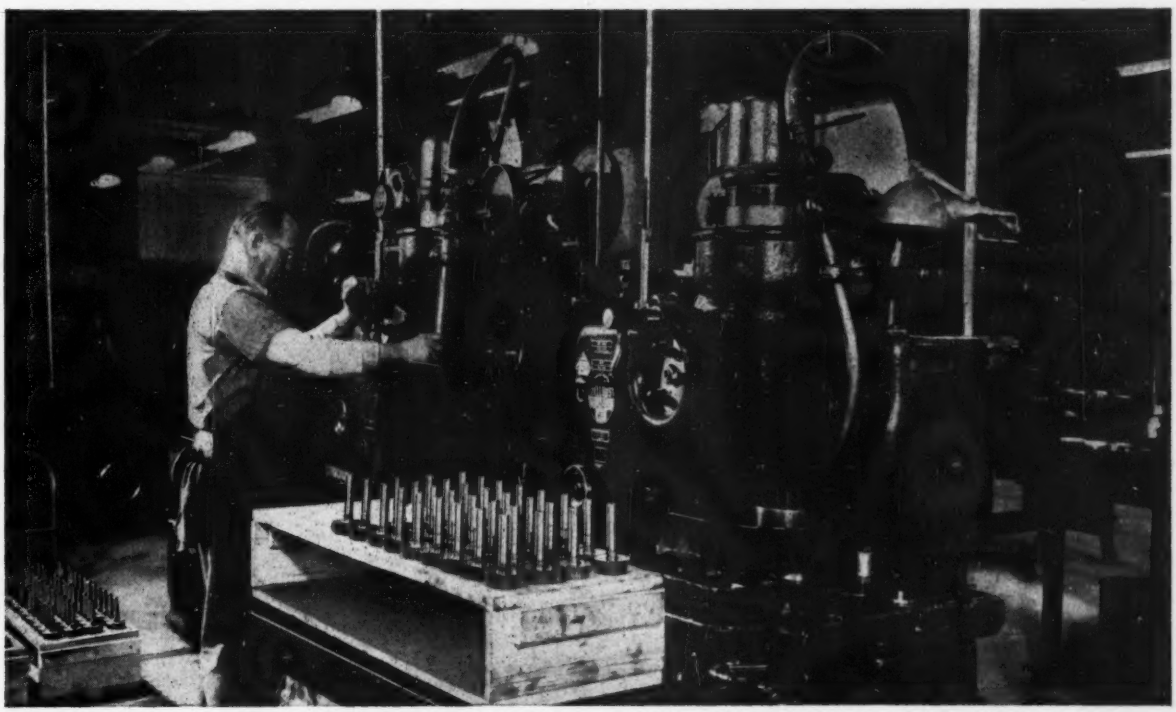
Send for your free copies of "Work Done on the Blanchard", fourth edition, and "Art of Blanchard Surface Grinding".

THE BLANCHARD MACHINE CO.

64 STATE ST., CAMBRIDGE 39, MASS., U. S. A.

"No doubt about it... Sinclair saves us money"

... says W. P. St. John, Owner, Radax Manufacturing Co., Rochelle Park, N. J.



Sinclair UMBRA making a tough job easier — gear cutting S.A.E. 4340 steel—45 Rockwell

The Radax Manufacturing Company has a reputation for tackling "tough jobs." As Mr. St. John says, "Our extensive equipment allows us to contract for extreme precision work – work that requires the very finest of cutting oils. We've been using Sinclair RIVALO®, UMBRA® and EMULSICOOL® exclusively for four years. They've enabled us to increase our production, produce better finishes and greatly reduce downtime for tool sharpening. As a result, our unit costs are less. There's no doubt Sinclair cutting oils are saving us money."

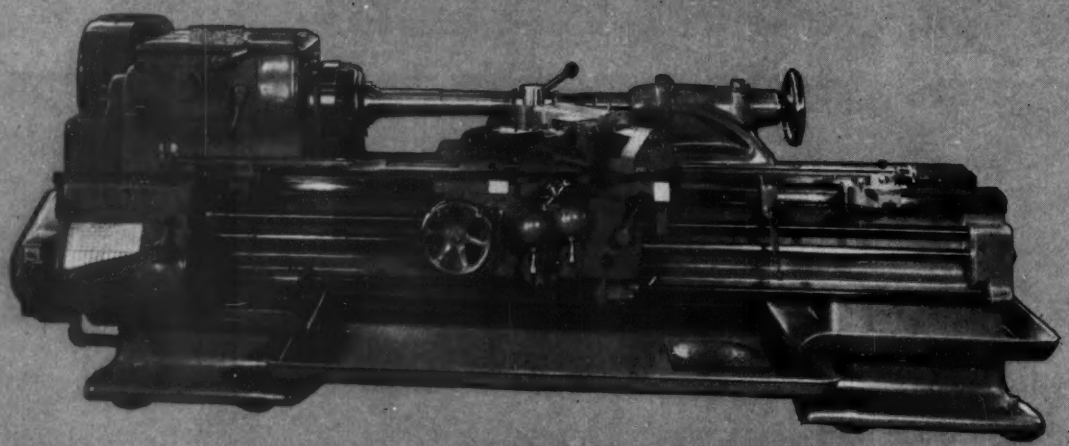
Sinclair cutting oils can help save money for you, too. Why not phone or write the nearest Sinclair Representative or write Sinclair Refining Company, 600 Fifth Avenue, New York 20, N. Y.

SINCLAIR CUTTING OILS and COOLANTS

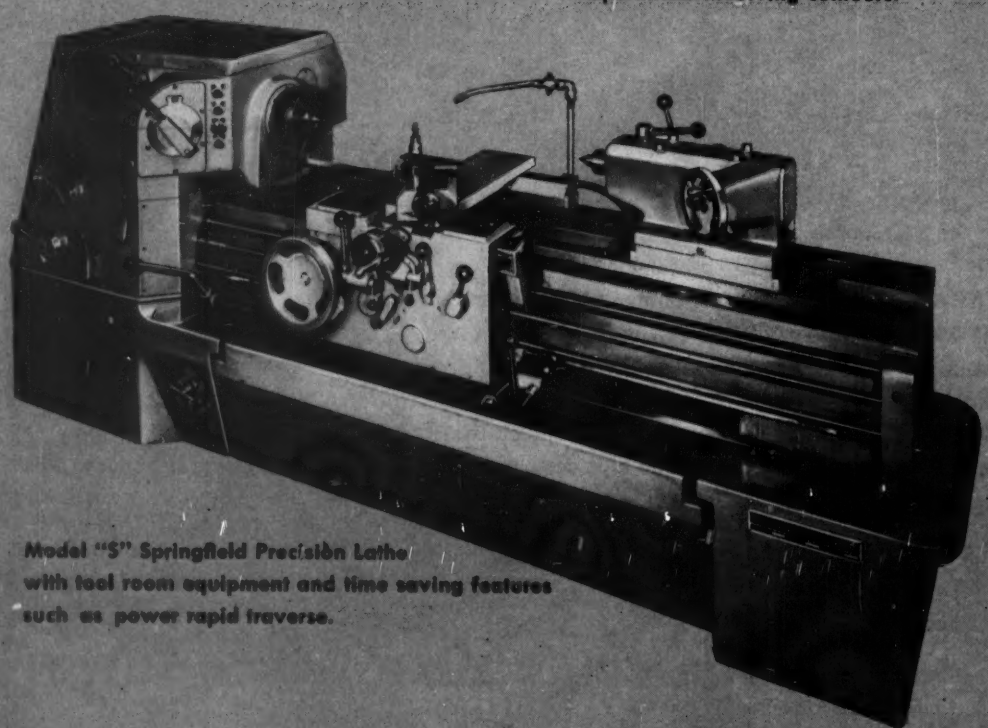
...for Metal Working

SPRINGFIELD

TURNING—CONTOURING—PROFILING—ENGRAVING—



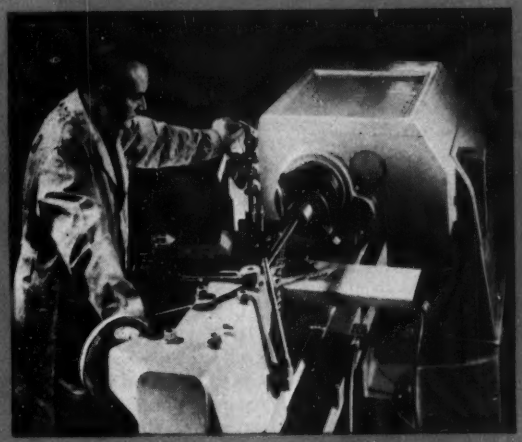
Model 180 Springfield Precision Lathe with Hydraulic Contouring Attachment for economical production of turning, boring and facing operations involving contours.



Model "S" Springfield Precision Lathe with tool room equipment and time saving features such as power rapid traverse.

LATHES

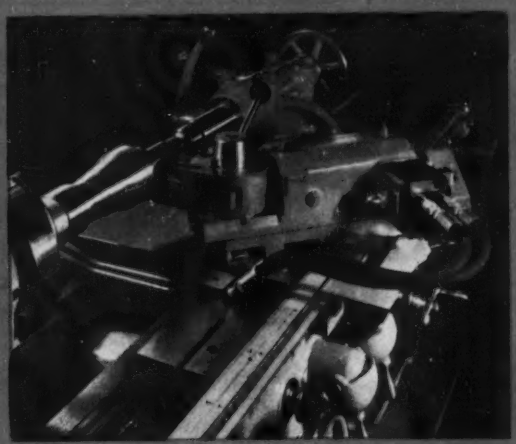
REPRODUCING — BORING — THREAD CHASING — RELIEVING



EFFORTLESS OPERATION

CUSTOM TOOLED

INTRICATE REPRODUCTION



PRODUCTION CONTOUR TURNING

Write for Catalog

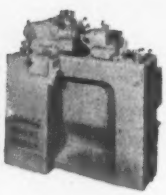
THE SPRINGFIELD MACHINE TOOL COMPANY

SPRINGFIELD, OHIO, U. S. A.

GENERAL DISTRIBUTORS: BRYANT MACHINERY & ENGINEERING COMPANY, 400 WEST MADISON ST., CHICAGO 6

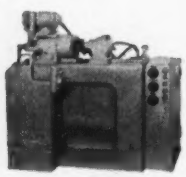
EXCLUSIVE REPRESENTATIVES IN ALL PRINCIPAL CITIES

bryant
internal grinding



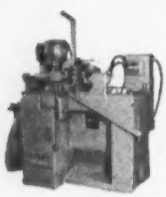
no. 1309-W

Finishes 2 bores and a taper straight and concentric. 2 wheelheads are used on this semi-automatic. Max. traverse stroke, 6". Max. grinding length, 3½".



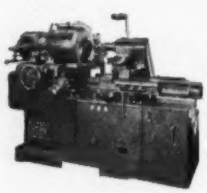
no. 1109

For high production of small bores where accuracy of size and finish are required. Max. traverse stroke, 6". Max. grinding length, 3½".



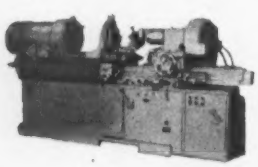
no. 2209

For precision and high production grinding of ball bearing races, gears, rolls, bushings, etc. Max. traverse stroke, 6". Max. grinding length, ¾".



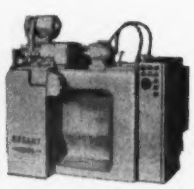
no. 1116

A general purpose hole grinder for tool room, small shop, or general production. Maximum traverse stroke, 20". Maximum grinding length, 8".



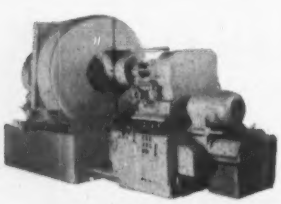
no. 1416

Specially designed for grinding bores in long work, such as machine tool spindles. Maximum traverse stroke, 20". Maximum grinding length, 8".



no. 1209

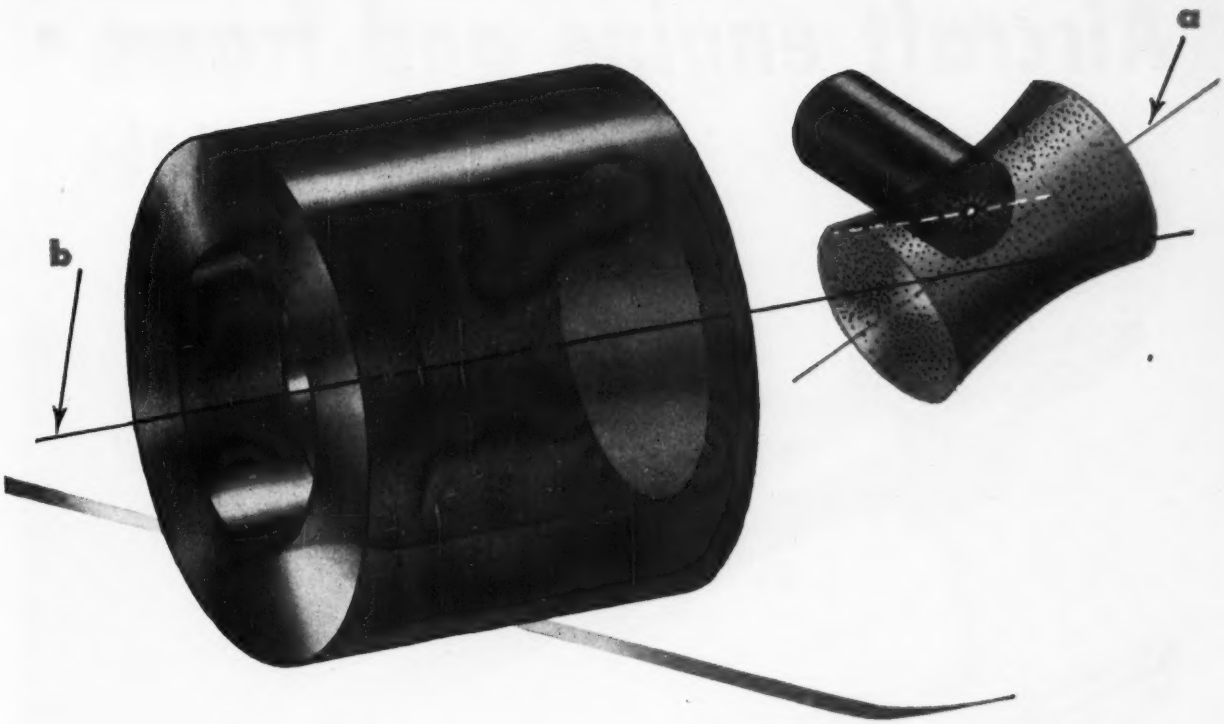
A fully automatic, high production machine for small and medium bore grinding. Max. traverse stroke, 6". Max. grinding length, 3".



no. 1460

For production or single piece hole grinding on parts up to 60" diameter. Max. traverse stroke, 21". Max. grinding length, 16".

"Alignment for Better Internal Grinding", a new, sound color moving picture is available for free showing to engineering groups. Write for descriptive booking form.



IT is generally believed in internal grinding that once the grinding wheel passes the diamond, the form of the wheel will be a perfect cylinder. In our illustration the wheel is tipped as it passes the diamond and an hourglass form is generated on the wheel. This condition is not peculiar to an internal grinder. The same form is generated in turning an O.D. on a lathe if the tailstock is either high or low.

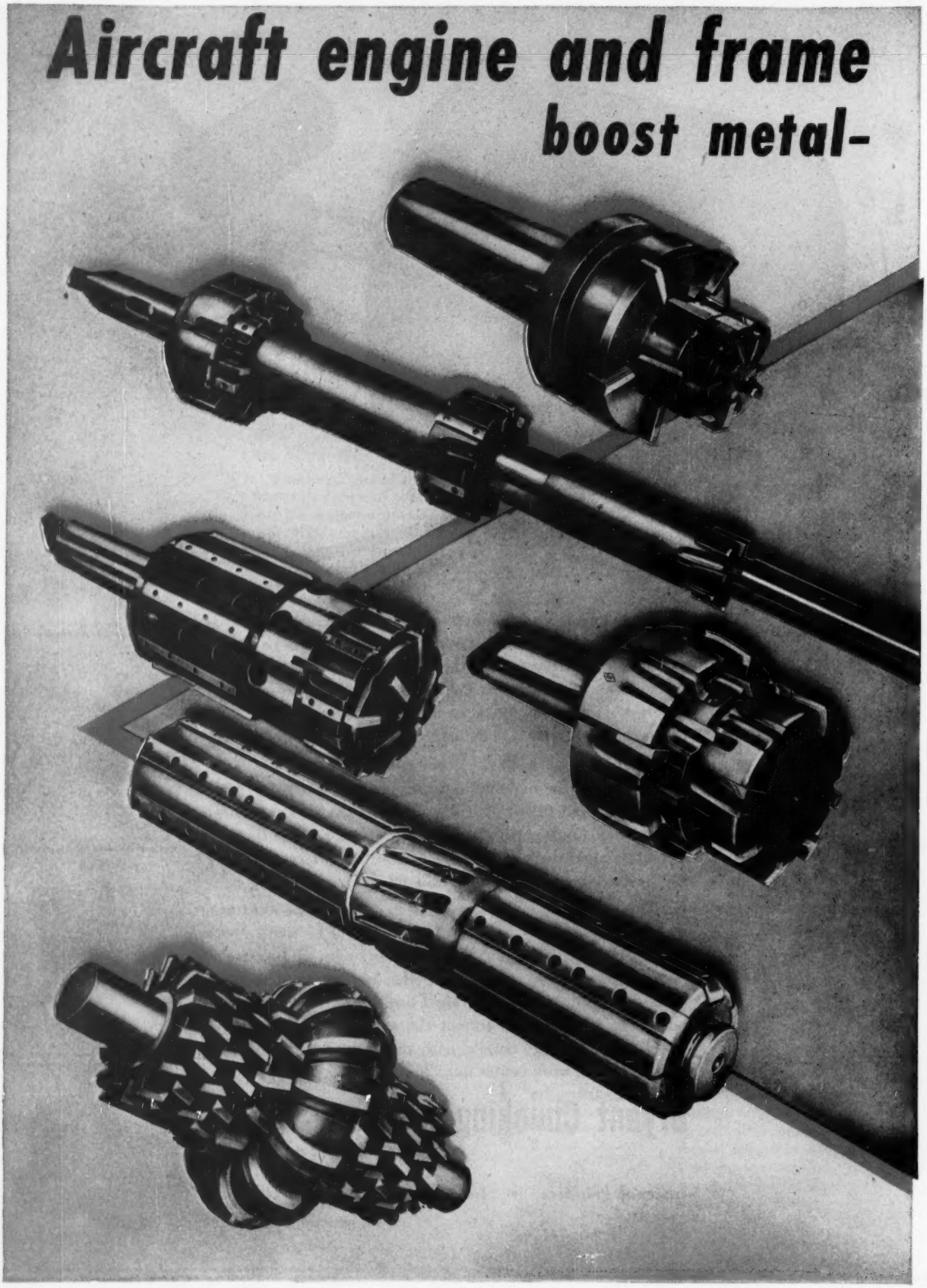
The path of the diamond is a straight line across the surface of the wheel, but the wheel will not contact the work on the same straight line. Contact may be at a point on each end of the wheel. Since the wheel does not contact across its full face, wheel wear will be excessive and the wheel will act soft.

The geometry of the hole may be upset as in the illustration, with the result that the back of the hole will be tight. Neither turning the workhead nor changing the length of traverse will correct this error. Because the wheel is contacting at either one or two points, instead of a straight line, the surface finish will be poor. The remedy is to correct the alignment by bringing the wheel center line "a" parallel with the path of the wheel and in plane with the work center line "b".

Bryant Chucking Grinder Company
Springfield, Vermont, U. S. A.

Internal grinders • Internal & External thread gages

Aircraft engine and frame boost metal-



manufacturers cutting operations with . . .

one-pass OK multiple diameter tools

Over fifty percent of O K tool orders from the aircraft industry are for combination cutters, designed to perform two, three and four operations with one pass of the tool. These tools take bulldog-bite rough cuts, or cobweb-thin, micro-finish cuts, with no restrictions as to metals, which run from stainless steel for jet-engine parts to heat-treated aluminum for cylinders and high-speed steel for triple-step lathe chuck jaws. Former production records are demolished! Where, yesterday, five pieces on the floor, was considered good; today, you find 30 pieces, inspected and passed.

TYPICAL MULTI-PURPOSE TOOLS

Designed from your blueprints or sample and specifications
COMBINATION BORING, REAMING AND CHAMFERING HEADS
BORING AND FACING MILLS FOR RADIAL DRILLING
PILOTED TREPANNING AND REAMING TOOLS FOR DEEP HOLE WORK
GANG CUTTERS FOR SLAB-MILLING
CHROME-MOLY PLATES FOR PROP BLADES

BUILT WITH MORE BEEF IN THE BODY

To better take the punishment of carbide milling, O K tools, by virtue of their simple, two-component design, are huskier in the body, size for size; thus permitting closer blade spacing for close tolerance work, and heavier blades for hogging jobs. Blades are wedge-shape* blocks. Blades, once seated and driven home, never budge. Mated serrations prevent lateral movement; provide an accurate adjustment to compensate for wear. Grinding is minimized to .005" per blade by fine-tooth features. Bodies are not weakened with cutouts for locks, screws, pins, gibs or gadgets. Of these, O K can nicely do without.

FREE CATALOGS

"Modern Milling Cutters for Modern Milling Machines"
"America's First System of Insert Single Point Tools"

THE O K TOOL COMPANY
Milford, New Hampshire

OK

modern milling cutters for modern milling machines

*The wedge is the world's strongest mechanical device.

steel doubles for brass when lead gets in the act!

INLAND'S *patented*

LEDLOY®...

...now being used to replace brass for

LEDLOY, Inland's lead-bearing steel family, is in shorter supply than ever before. In addition to the increased clamor for LEDLOY in civilian products, the pressure is on for these remarkable free machining steels for use by the military. Today, almost all LEDLOY is going directly into defense production.

Now, LEDLOY replaces scarce brass in projectile parts. It weighs and costs far less and has better physical properties.

The secret of LEDLOY is lead, added to molten open hearth steel by a patented process developed by Inland. Lead does not alter the physical properties of the steel in any way but

here are 4 examples

of what LEDLOY® steels have done . . .

Example A: For a three-piece, high-pressure hydraulic fitting requiring severe cold working, LEDLOY Grade A, without any sacrifice in quality, increased production 108% on one part formerly made from C1117. Production rates were increased 41% and 23% on the other two parts originally made from B1113.

Example B: On a gear hob formerly manufactured from B1113, production time with LEDLOY Grade B was reduced 48½% from 7.8 seconds per part to 4 seconds.

Example C: The rate of production on a grease gun part was increased from 265 to 509 . . . a 91% increase . . . when LEDLOY Grade B was substituted for B1113.

Example D: During the Battle of Britain in World War II, one of England's leading steel men, licensed to produce this Inland product in England, became convinced that the machining properties of this new steel could materially help to break the bottleneck in 20 MM shell production. He bet Winston Churchill that using LEDLOY would provide many more shell projectile bodies in less time. To back up this conviction, he made this offer: he would supply 200 tons of LEDLOY on a trial basis. If it didn't work out to everyone's complete satisfaction, he would make no charge for the steel and would also personally donate a Spitfire fighter plane to the war effort. LEDLOY did everything he claimed it would and, since that time, Britain has used LEDLOY almost exclusively for these shell parts.

world's most machinable steel

shell components

does amazing things to the steel's machinability.

The use of LEDLOY steels is a story of faster production, longer tool life and superior surface.

LEDLOY is not a steel of any single analysis but is Inland's registered trade name for any steel made by Inland's special process of adding lead to steel.

INLAND

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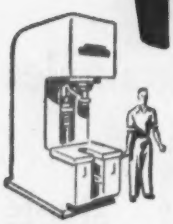


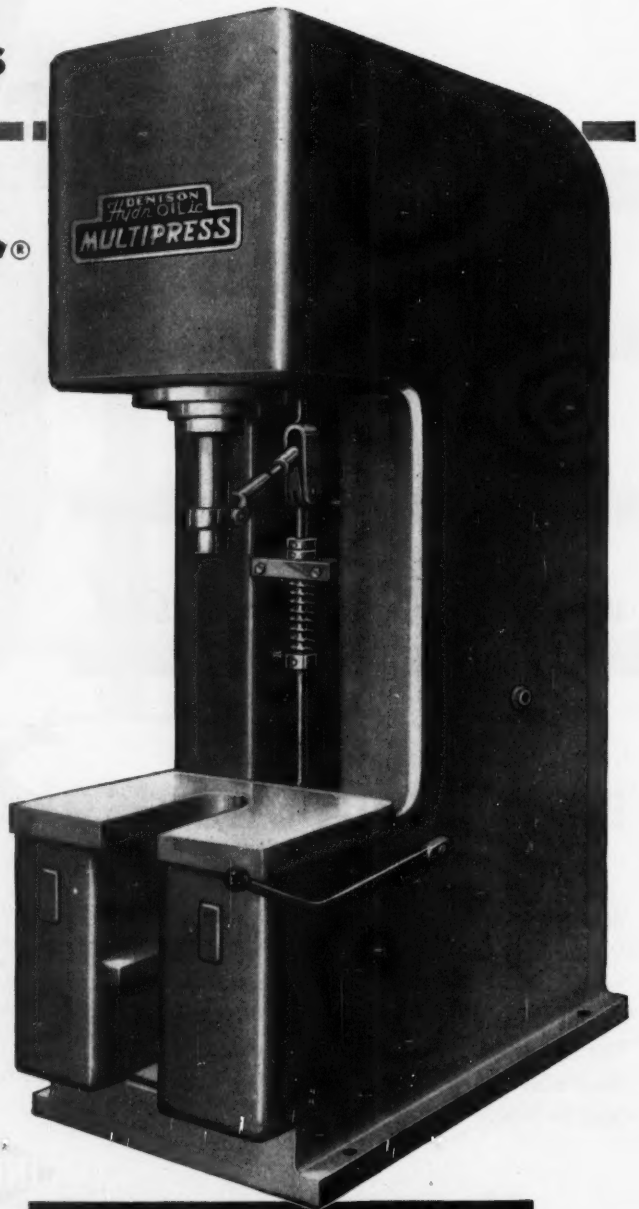
NOW Cost-cutting, servo-type "touch control"

up to 75 tons

With this new and bigger

MULTIPRESS®

you can now have all of the operating advantages of the well-known Multipress line — plus the advantages of the new servo-type Touch Control... for applications up to 75 tons!



IDEAL FOR STRAIGHTENING, DIE SINKING, COMPACTION, ASSEMBLY. With this new heavy-duty *Touch Control* Multipress, you can make the ram travel fast or slow . . . stop or reverse it any time . . . hold it at any point . . . bear down on the work with a few pounds of pressure or all 75 tons . . . repeat pressures as rapidly as you can manipulate the hand levers . . . and hold pressure on the work for any needed dwell period.

Touch Control gives the operator a positive, direct "feel" of the operation — adds his own skill to the smooth, dependable accuracy of the Multipress ram. And he gets *instantaneous response* to every action of the hand lever.

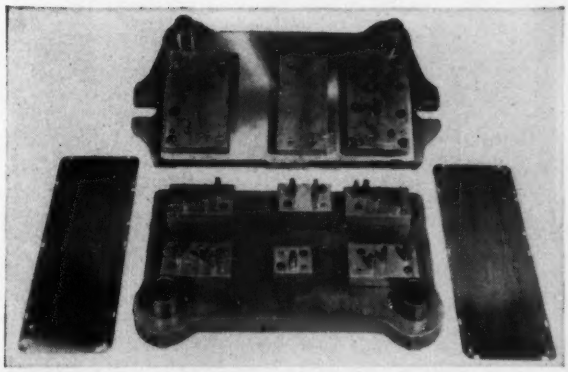
Applied pressures are quickly and accurately shown on the dial gauge. Stroke length is fully adjustable at both upper and lower limits. Maximum tonnage can be preset at any pressure within the limits of the press.

The 75-ton Multipress offers a 30-inch daylight opening (or gap) . . . 34-inch work table width . . . 13-inch throat depth . . . and a ram stroke that's fully adjustable up to the 15-inch maximum. Height, only 106 inches. *Write today* for full details on this versatile, big-job Multipress with TOUCH CONTROL.

The DENISON Engineering Co.
1152 Dublin Road, Columbus 16, Ohio

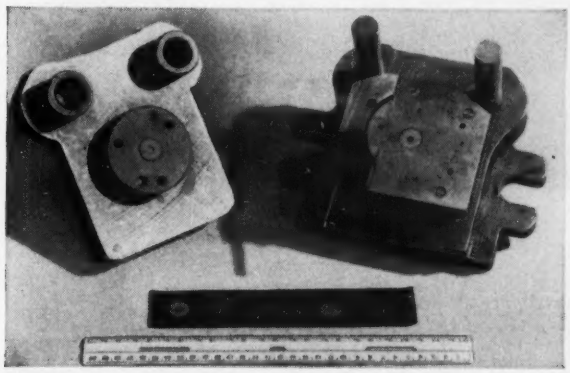
DENISON Hydr OILics

How free graphite in Graph-Mo® tool steel solved 4 big die problems

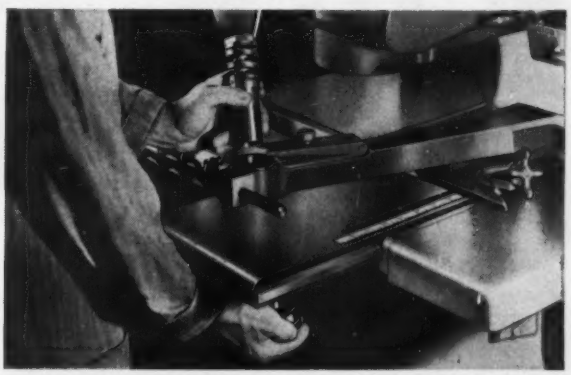


DIES USED BY PELTON & CRANE CO. became worn after a few hundred stampings. Holes in parts were ragged, punches chipped and cracked. After switching to Graph-Mo® tool steel for its dies, Pelton & Crane ran 12,000 stampings with no sign of wear. Free graphite and diamond-hard carbides in its structure give Graph-Mo minimum tendency to scuff or gall, unusual resistance to wear.

MOLDS USED BY PARKER APPLIANCE CO. lacked stability after hardening, were also hard to machine. Parker switched to Graph-Mo, reported, "Graph-Mo is ideal because it is free machining, dimensionally stable after hardening". Graph-Mo tool steel machines 30% easier.



GEAR DIES USED BY RELIABLE TOOL & DIE CO. threw burrs. Gear teeth spalled, dies chipped, didn't last long. Then Reliable switched to Graph-Mo tool steel for its dies. Result: dies now produce up to 80,000 without a burr. Free graphite gives Graph-Mo minimum tendency to scuff, seize or gall.

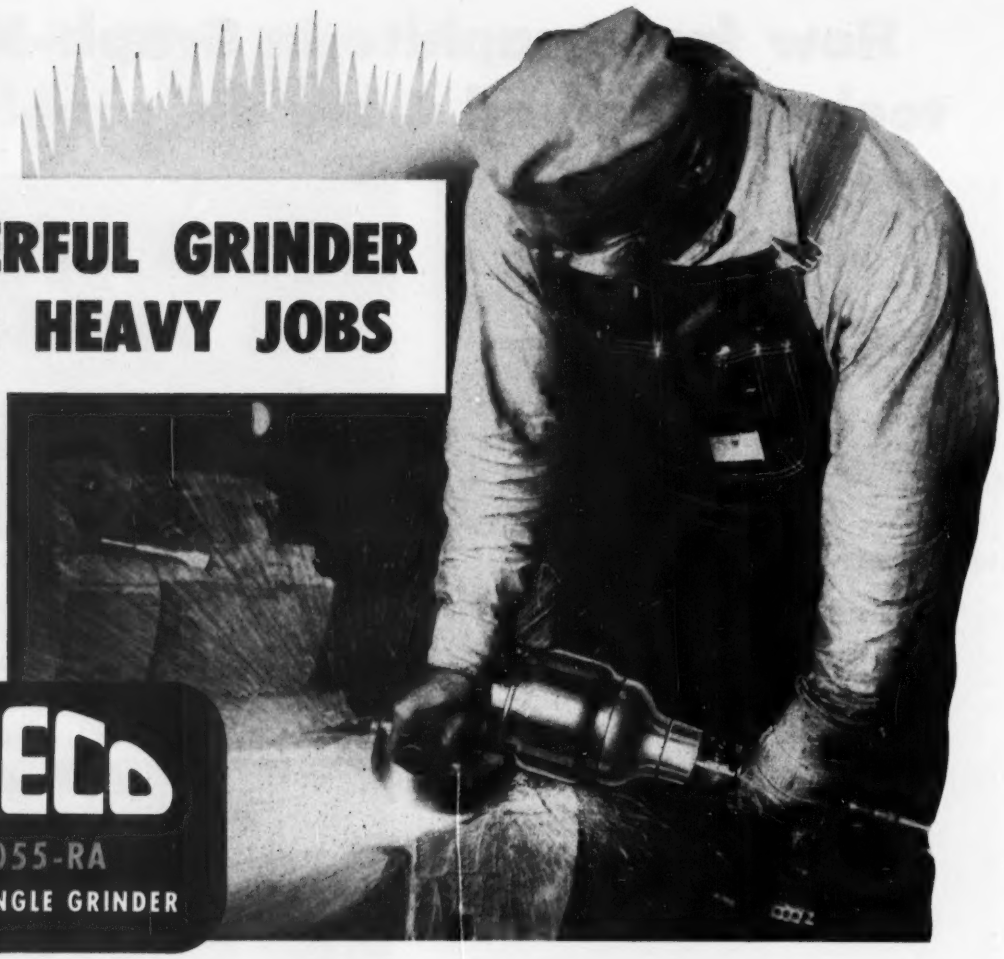


AFTER TESTING SEVERAL oil hardening tool steels for punches and dies, Wales-Strippit Corp. selected Graph-Mo. They report, "Graph-Mo provides long life with minimum galling, exceptional wear resistance." For information on Graph-Mo and three other Timken® graphitic tool steels, write The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

POWERFUL GRINDER FOR HEAVY JOBS



CLECO
5055-RA
RIGHT ANGLE GRINDER

Here is the most powerful pneumatic right angle grinder made. Its high power output and air-operated governor insure sustained operating speed – even under loads that would stall most grinders.

The Cleco 5055-RA is recommended for use on large castings, ship propellers and for cleaning heavy welds. On one job, for example, a heavy flame weld was normally chipped and then ground, the operation took 1½ to 2 hours. With the 5055-RA the chipping operation was unnecessary and the grinding took only 15 minutes.

If you have heavy work, write us and a Cleco representative will make an on-the-spot demonstration at your convenience.

CLECO AIR TOOLS

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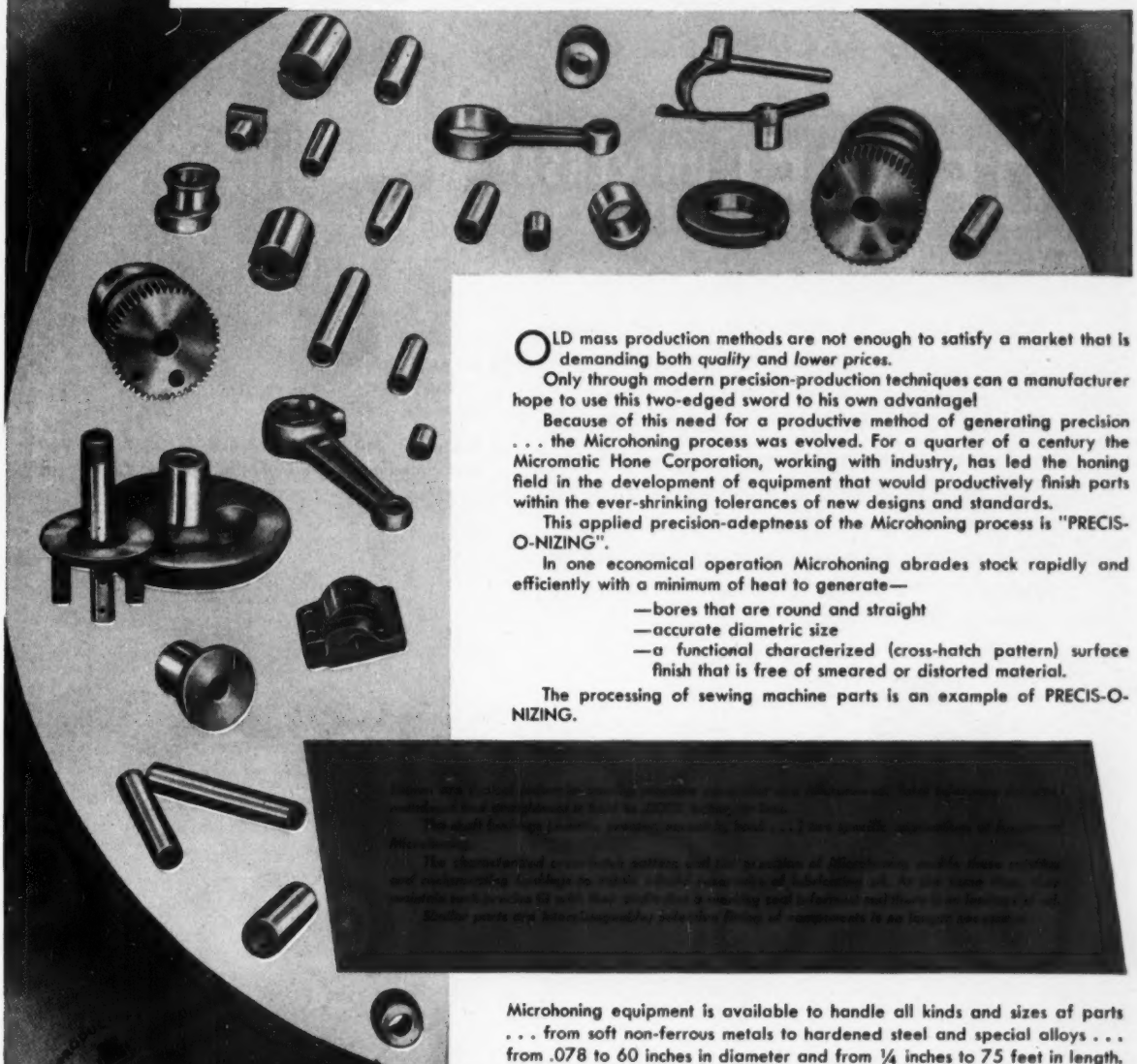
3347

FOR PRECISION

PLUS PRODUCTION . . .

PRECIS-O-NIZING



OLD mass production methods are not enough to satisfy a market that is demanding both *quality* and *lower prices*.

Only through modern precision-production techniques can a manufacturer hope to use this two-edged sword to his own advantage!

Because of this need for a productive method of generating precision . . . the Microhoning process was evolved. For a quarter of a century the Micromatic Hone Corporation, working with industry, has led the honing field in the development of equipment that would productively finish parts within the ever-shrinking tolerances of new designs and standards.

This applied precision-adeptness of the Microhoning process is "PRECIS-O-NIZING".

In one economical operation Microhoning abrades stock rapidly and efficiently with a minimum of heat to generate—

—bores that are round and straight
—accurate diametric size
—a functional characterized (cross-hatch pattern) surface finish that is free of smeared or distorted material.

The processing of sewing machine parts is an example of PRECIS-O-NIZING.

Microhoning equipment is available to handle all kinds and sizes of parts . . . from soft non-ferrous metals to hardened steel and special alloys . . . from .078 to 60 inches in diameter and from ¼ inches to 75 feet in length.

MICROHONING = STOCK REMOVAL + GEOMETRY + SIZE CONTROL + SURFACE FINISH

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REPRESENTATIVES: Overgard Machine Tool Company, 234 Commonwealth Bldg., Denver 2, Colorado
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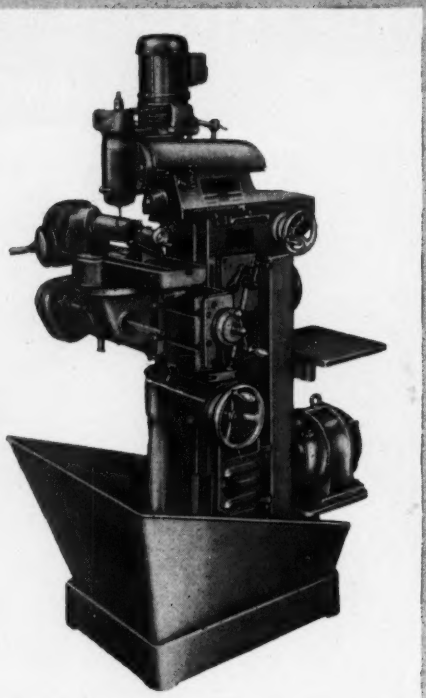
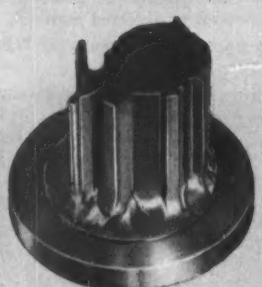
Intricate PIECES MACHINED EASILY AND ACCURATELY ON

DECKEL UNIVERSAL MILLERS

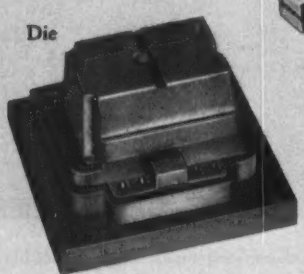


Model FP1 Milling spiral slot using High-speed Vertical Spindle Head and Spiral Milling Attachment

Whether making highly developed fixtures, simple tools or gauges, or odd-shaped parts, you can produce them more efficiently and accurately on a DECKEL FP1 Universal Miller. Production goes up and costs go down because you can accurately perform any type of milling—horizontal, vertical, angular or spiral—plus drilling, boring, or slotting on ONE machine. Eliminate the loss of valuable time caused by waiting for openings and set-ups on single-purpose machines.



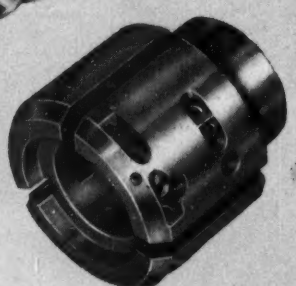
Punch



Die

Fitting

Machine Tool Part



Clamping Fixture

For output, accuracy, surface finish, and ease of operation a Deckel Universal Miller is "A MUST" in your tool room or precision milling department. Investigate today, write for a complete catalog or ask for a Cosa engineer to show you how a Deckel Universal will increase production and reduce cost on your work.

Other Deckel Machines for Tooling & Production

2 DIMENSIONAL ENGRAVERS
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COSA CORPORATION

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Sharpening on Peter Wolters ST 2 is simple enough to be handled by unskilled operators.

The entire cutting edge of a carbide tool can be lapped on this machine in one, rapid, accurate, pre-set operation, even if it includes planes of two different angles. Tool support and special swivelling device enable you to lap cutting edges and radius without unclamping the tool. Furthermore, no change of wheels is necessary between grinding and lapping. The outer of two concentric diamond wheels projects for rough grinding and a lever advances the inner wheel for finishing. Various tool holders are available for lapping a wide range of shapes. A centering microscope, of 20X magnification, can be used to pre-determine radius of the cutting tool and to examine the cutting edge.

Carbide cutting tools sharpened on ordinary grinding machines look like this under a microscope:

During machining operations, the peaks break quickly, the edge is dulled, and the tool must be resharpened or replaced. This means your cost and time loss is high — per production hour or per tool. However, tools ground and lapped with a Peter Wolters machine look like this:

The cutting edge is smooth, without unsupported, easily broken projections. Thus, these tools last longer and therefore cost you less in time and money. The Peter Wolters tool grinding and lapping machine can amortize itself in very short order and give you substantial net savings thereafter.

Get in touch with us and see how much time and money this unit can save in your plant. Write for bulletin or have our representative call on you.

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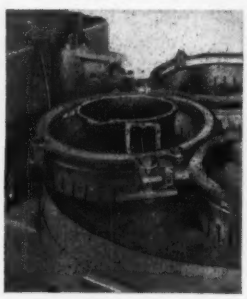
Prove It To Yourself!

...You Can Now Obtain Precision Flatness, Finish and Parallelity in Production Quantities

Many manufacturers of pumps, compressors, valves and other equipment containing liquids or air under high pressures are now using production lapping to great advantage—have eliminated gaskets in mating surfaces, have improved product performance. This has been made possible through the extreme accuracy of work produced by the Lapmaster in production quantities. Micro-inch finishes of 2 to 3 RMS are common. Surface flatness can be held to less than .0000116".

A TYPICAL CASE



Four Model 72" Lapmasters were installed in an automotive plant for lapping the joint faces on large castings. These Lapmasters are able to keep pace with the high production requirements of automotive plants because there is no down-time required for reconditioning the lapping plate. In addition, parts lapped by the Lapmaster can be brought directly from the milling operation to lapping. Intermediate grinding operations are eliminated. Still another important feature is the fact that joint faces are lapped so accurately, gaskets can be eliminated in final assembly; the resulting metal to metal contact also eliminates distortion caused by the conventional use of gaskets.

Use Our

Free Laboratory Service

to Determine Your Exact Needs

To determine whether lapping can be practical and profitable for you, we maintain a laboratory for lapping sample parts. If you believe it offers possibilities we invite you to send prints of the parts, together with surface finish requirements and production desired. In addition send several parts for test lapping. We can then give you the facts on what you can expect from the Lapmaster. There is no obligation for this service.

Additional Data

on the complete line of Lapmasters is available on request, also new information on Measuring Flatness. Write for your copies today.

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. . . *but*
Experience Cannot be Copied

More than a quarter-century ago MARVEL invented and basically patented the MARVEL High-Speed-Edge Hack Saw Blade—the UNBREAKABLE blade that increased hack sawing efficiency many-fold.

Every MARVEL Hack Saw Blade ever sold has been of that basic welded high-speed-edge construction, with constant improvements from year to year, as EXPERIENCE augmented the "know-how" . . .

MARVEL is not "tied" to any single source of steel supply, and has always used the best high speed steels that became available from time to time as metallurgy progressed. When-as-and-if finer steels are developed—and are proven commercially practical for welded-edge hack saw blades—MARVEL will use them, regardless of cost or source . . .

There is only one genuine MARVEL High-Speed-Edge! All other "composite" or "welded-edge" hack saw blades are merely flattering attempts to imitate — without the "know-how" of MARVEL EXPERIENCE . . .

Insist upon *genuine* MARVEL High-Speed-Edge when buying hack saw blades—and be SAFE, for you can depend upon MARVEL. They have been "tested", "pre-tested", and "re-tested" by thousands of users for more than a quarter-century!

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Better Machines-Better Blades

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Product Directory

To find headings easily, look for capital letters at top of each page to denote locations.

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Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Walis Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

ABRASIVE DISCS
See Discs, Abrasive.

ABRASIVES, Polishing, Tumbling, Etc.
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Simonds Abrasive Co., Tacony and Fraley Sts., Bridesburg, Philadelphia, Pa.

ACCUMULATORS, Hydraulic
American Steel Foundries, Elmes Engineering Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Farquhar, A. B., Div. Oliver Corp., 21 Duke St., York, Pa.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Greer Hydraulics, Inc., 454—18th St., Brooklyn 15, N. Y.
Lake Erie Engrg. Corp., Kenmore Sta., Buffalo, N. Y.
Morgan Engineering Co., Alliance, Ohio.
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wood, R. D., Co., Public Ledger Bldg., Philadelphia 5, Pa.

AIR HOISTS—See Hoists, Air.

AIR TOOLS—See Grinders, Pneumatic; Drills, Portable Pneumatic, Etc.

ALLOY STEELS
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., New York 1, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Frasse, Peter A., & Co., Inc., 17 Grant St., New York 13, N. Y.
Republic Steel Corp., Union Drawn Steel Div., Republic Bldg., Cleveland, Ohio.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp., Carnegie-Illinois Steel Corp. Div., 436 7th Ave., Pittsburgh, Pa.
Vanadium Alloys Steel Co., Latrobe, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

ALLOY STEELS, High Temperature
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.

ALLOYS, Aluminum
Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.

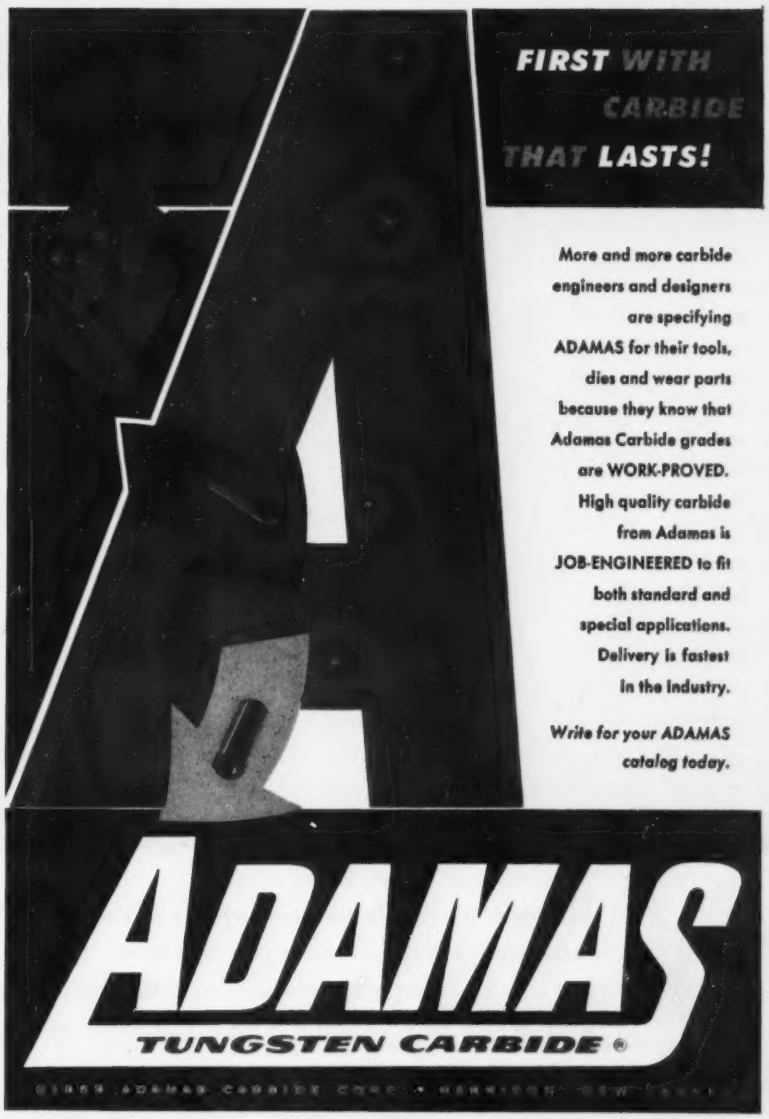
ALLOYS, Magnesium
Dow Chemical Co., Midland, Mich.

ALLOYS, Non-Ferrous
American Brass Co., 25 Broadway, New York.
Chase Brass & Copper Co., Inc., 1949 Rodney St., Waterbury 20, Conn.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

ARBOR PRESSES
See Presses, Arbor.

ARBORS AND MANDRELS
Beaver Tool & Engineering Corp. (Arbors, only), 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Danly Machine Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Erickson Tools, Div. Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Jacobs Mfg. Co., West Hartford, Conn.
Kempsmith Machine Co., 1819 S. 71st St., Milwaukee 14, Wis.
Keo Cutters, 19326 Woodward, Detroit, Mich.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

(Continued on page 326)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TUNGSTEN CARBIDE ®

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the Entirely New 12-inch ACME-GRIDLEY

SINGLE-SPINDLE AUTOMATIC CHUCKING MACHINE

1

WORK CYCLE AUTOMATICALLY CONTROLLED—**no time loss between loading and unloading work piece.**

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SIX PREDETERMINED SELECTIVE SPINDLE SPEEDS, with each combination of change gears, insure correct surface speed for each operation. Wide range of spindle speeds—25 to 1478 RPM.

Two Automatically Selective Feed Ranges with each combination of change gears—for coarse or fine feeds to suit the particular tooling cut.

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Turret Indexing Independent of cross slide operation—located in rugged outer turret support and driven by independent motor.

Open Type Tooling Zone—easy tool adjustments and quick changeover. Minimum cam changes, large chip area, optional chip conveyor.

Accurate—doubly reinforced frame foundation, precision-cut flame hardened steel cams—sustain close tolerances at fastest feeds and highest speeds modern carbide cutting tools can take.

Easy to Operate—compact, free from gadgets—one man runs 2 machines or more, depending on cycle time of job.

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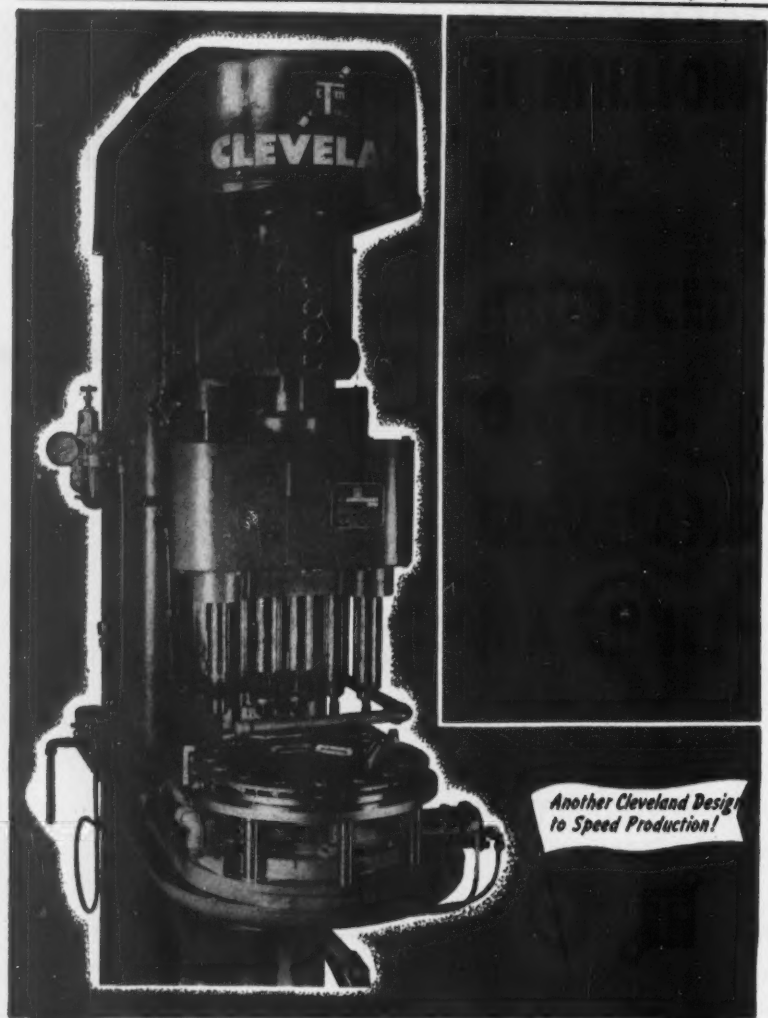

This Cleveland Model E-24 has been on the job day in and day out since July 1949. With one stroke of the machine it completes 2 pieces—Core drilling, countersinking and Tapping ¾ - 10 Thread in Malleable Iron Castings.

It is another example of how production can be speeded up and costs reduced when you bring your production problems to Cleveland. Cleveland engineers can design a machine for you that will cut costs by combining several operations. And when you get a "Cleveland" you get all the proven advantages of the famous lead screw design that means more perfect pieces per hour.

Whatever operations you require . . . Core Drilling . . . Reaming . . . Tapping . . . Threading . . . Chamfering . . . it will pay you to call Cleveland.

Write today for Catalog No. MA-43

THE CLEVELAND TAPPING MACHINE CO.

A Subsidiary of AUTOMATIC STEEL PRODUCTS, INC.

CANTON 6, OHIO

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Johnson Bronze Co., New Castle, Pa.
Ryerson, Jos. T., & Son, 2558 W. 16th St., Chicago 18, Ill.

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Keller Tool Co., Grand Haven, Mich.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pope Machinery Corp., Haverhill, Mass.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

BALLS

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Kennametal, Inc., Latrobe, Pa.
S K F Industries, Inc., P. O. Box 6731, North Philadelphia, Pa.

BARS, Phosphor Bronze

Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Johnson Bronze Co., New Castle, Pa.

BARS, Steel

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Frasse, Peter A., & Co., Inc., 17 Grand St., New York 13, N. Y.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
LaSalle Steel Co., Hammond, Ind.
Republic Steel Corp., Union Drawn Steel Div., (Cold Drawn), Republic Bldg., Cleveland, Ohio.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.
Summerill Tubing Co., Div. Columbia Steel & Shafting Co., P. O. Box 1557, Pittsburgh 30, Pa.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp. Div., Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

BASES, Machinery Welded

Mahon, R. C., Co., 6565 E. 8 Mile Rd., Detroit 34, Mich.

BEARINGS, Babbitt

Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
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Link-Belt Co., 2410 W. 18th St., Chicago 8, Ill.

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Boston Gear Works, 3200 Main St., North Quincy, Mass.
C & C Sales Corp., 1771 Broadway, New York 19, N. Y.
Fafnir Bearing Co., New Britain, Conn.
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Link-Belt Co., 519 N. Holmes Ave., Indianapolis 6, Ind.
Marlin-Rockwell Corp., 402 Chandler Bldg., Jamestown, N. Y.
Nice Ball Bearing Co., Nicetown, Philadelphia, Pa.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
S K F Industries, Inc., P. O. Box 6731, North Philadelphia, Pa.
Torrington Co., Torrington, Conn.

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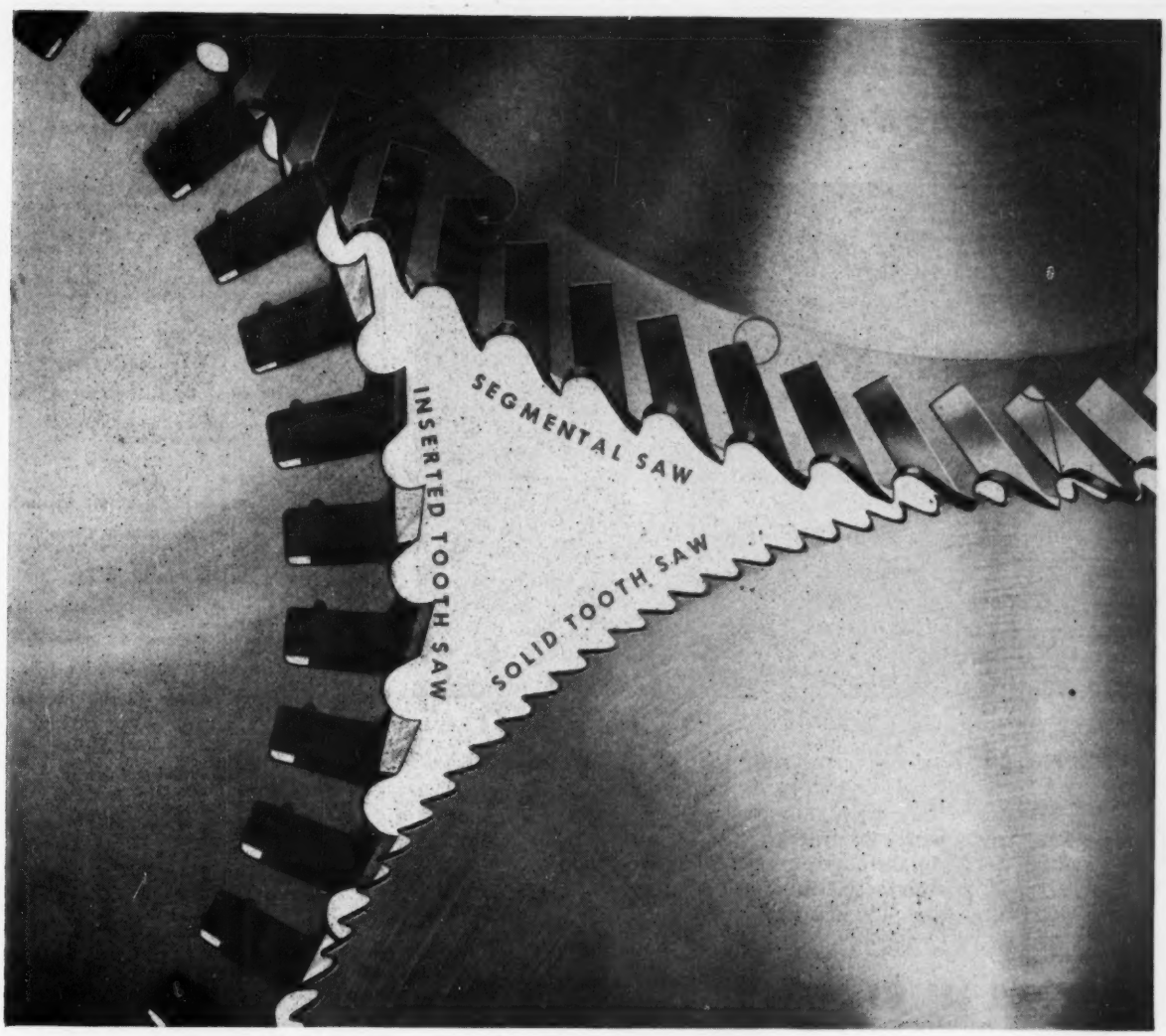

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Johnson Bronze Co., New Castle, Pa.
Link-Belt Co., 2410 W. 18th St., Chicago 8, Ill.

BEARINGS, Lineshaft

Fafnir Bearing Co., New Britain, Conn.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis 6, Ind.
Shafer Bearing Corp., Downers Grove, Ill.
S K F Industries, Inc., P. O. Box 6731, North Philadelphia, Pa.
Orange Roller Bearing Co., Inc., Orange, N. J.
Standard Pressed Steel Co., Jenkintown, Pa.

BEARINGS, Needle

C & C Sales Corp., 1771 Broadway, New York 19, N. Y.
Kaydon Engineering Corp., McCracken St., Muskegon, Mich.
Orange Roller Bearing Co., Inc., Orange, N. J.
Torrington Co., Torrington, Conn.

BEARINGS, Roller

Aetna Ball & Roller Bearing Co., 4612 Schubert Ave., Chicago, Ill.
Ball & Roller Bearing Co., Danbury, Conn.
C & C Sales Corp., 1771 Broadway, New York 19, N. Y.
Fafnir Bearing Co., New Britain, Conn.
Hyatt Bearings Div., Harrison, N. J.
Kaydon Engineering Corp., McCracken St., Muskegon, Mich.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis 6, Ind.
Marlin-Rockford Corp., 402 Chandler Bldg., Jamestown, N. Y.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
Orange Roller Bearing Co., Inc., Orange, N. J.
Rollway Bearings Co., Inc., 541 Seymour St., Syracuse, N. Y.
Shafer Bearing Corp., Downers Grove, Ill.
S K F Industries, Inc., P. O. Box 6731, North Philadelphia, Pa.
Timken Roller Bearing Co., Canton, Ohio.
Torrington Co., Torrington, Conn.

BEARINGS, Self-Lubricating (Oilless)

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Jergens, J. G., Co., 11106 Avon Ave., Cleveland 5, Ohio.
Kaydon Engineering Corp., McCracken St., Muskegon, Mich.
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BEARINGS, Thrust

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Ball & Roller Bearing Co., Danbury, Conn.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Fafnir Bearing Co., New Britain, Conn.
General Electric Co., Schenectady, N. Y.
Kaydon Engineering Corp., McCracken St., Muskegon, Mich.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis 6, Ind.
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Torrington Co., Torrington, Conn.

BELT SHIFTERS

Standard Pressed Steel Co., Jenkintown, Pa.

BELTING TRANSMISSION

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(Continued on page 330)

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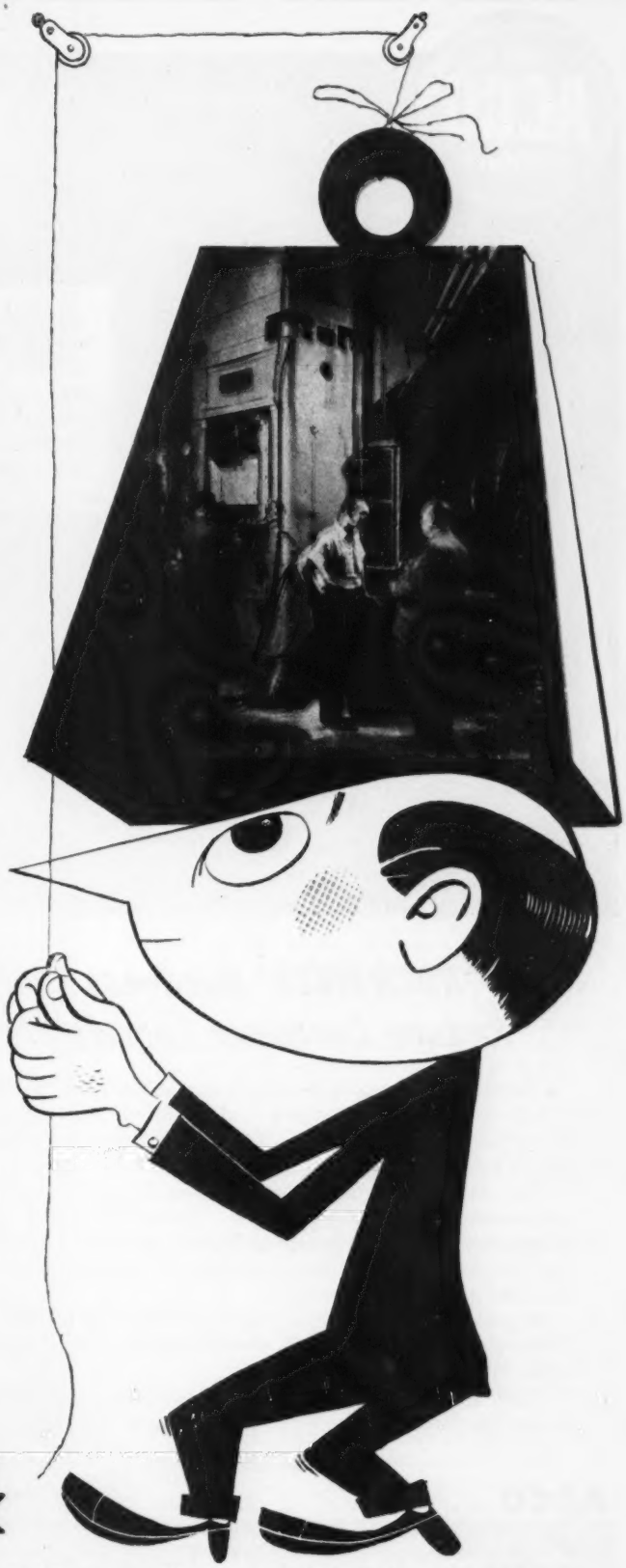

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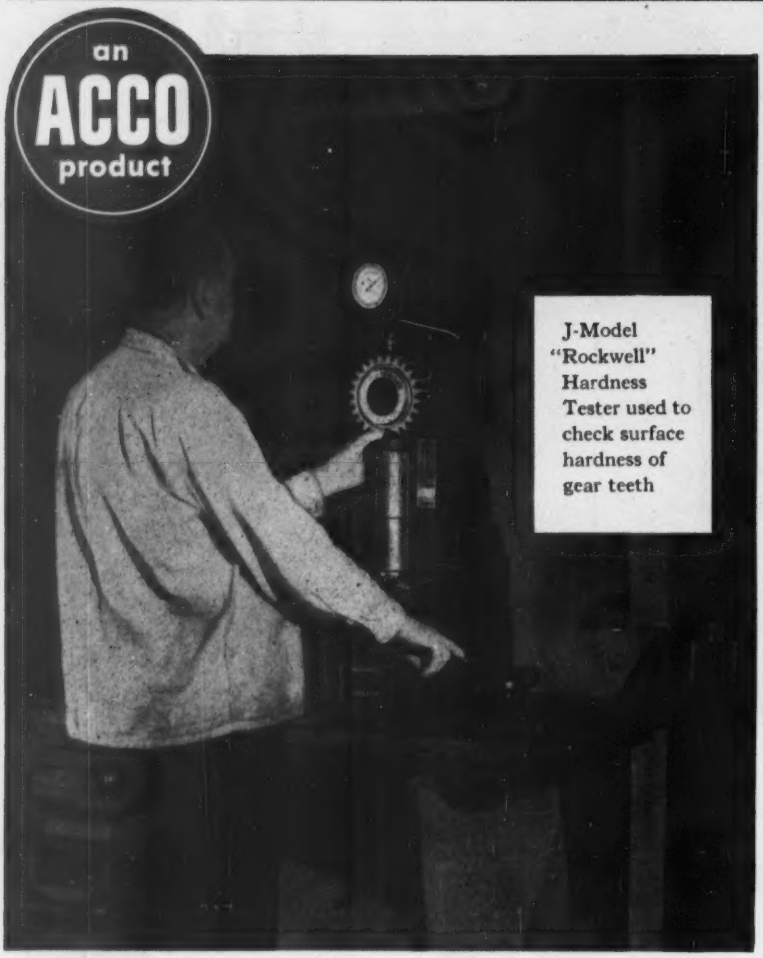

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Lake Erie Engrg. Corp., Kenmore Sta., Buffalo, N. Y.
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Wood, R. D., Co., Public Ledger Bldg., Philadelphia 5, Pa.

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Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

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Westinghouse Electric Corp., Pittsburgh 30, Pa.

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Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
Republic Steel Corp., Steel and Tubes Div., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp., National Tube Co., Div., 436 7th Ave., Pittsburgh, Pa.

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Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Landis Machine Co., Inc., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
New Britain Machine Co., New Britain-Gridley Mch. Div., New Britain, Conn.

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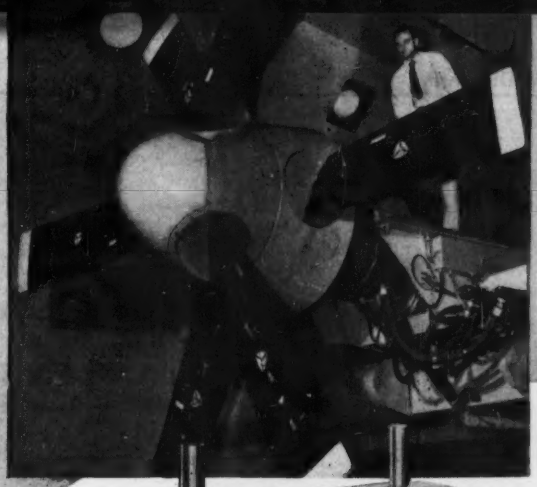
Bethlehem Steel Co., Bethlehem, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
Ottemiller, W. H., & Co., York, Pa.
Republic Steel Corp., Bolt & Nut Div., Republic Bldg., Cleveland 1, Ohio.
Russell, Burdsall & Ward Bolt & Nut Co., 100 Midland Ave., Port Chester, N. Y.

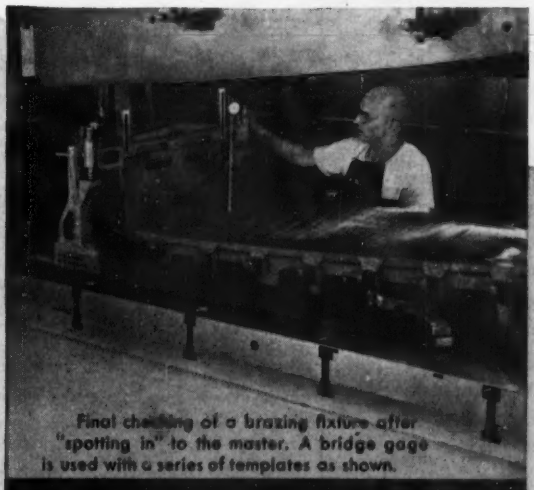
(Continued on page 332)



High speed aircraft propeller on test stand—built from tools "spotted in" in a DANLY SPECIAL DIE SET.

DANLY SPECIAL DIE SET, 46 by 140 inches, used for both production and checking of aircraft propeller tools.

DANLY SPECIAL DIE SETS



Final checking of a brazing fixture after "spotting in" to the master. A bridge gage is used with a series of templates as shown.

DEPENDABLE FOR ACCURACY

Here's proof . . . this Danly Special Die Set is used by one of the country's leading aircraft propeller manufacturers for "spotting in" all contour tools for a complete production line. Accuracy is a must because the tools, masters for duplicating planers and profilers as well as holding fixtures, must mate closely with the master pattern and with each other in the sequence of operations.

Dependable accuracy makes Danly Special Die Sets ideal for applications of this kind . . . and rugged construction makes them last longer, too, on any job. That's why leading diemakers everywhere prefer Danly Die Sets!

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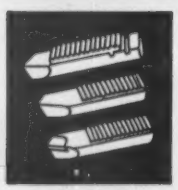
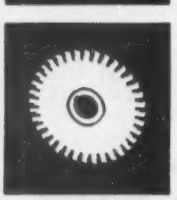
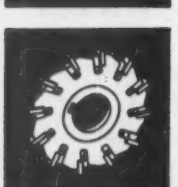
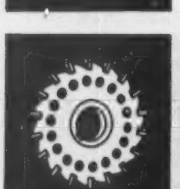
*Indicates complete stock

DANLY

DIE SETS AND DIEMAKERS' SUPPLIES



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Consolidated Mch. Tool Corp., Rochester, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Moline Tool Co., 102 20th St., Moline, Ill.
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National Acme Co., 170 E. 131st St., Cleveland, Ohio.
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Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Triplex Machine Tool Corp., 75 West St., New York 6, N. Y.

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Bullard Co., Brewster St., Bridgeport 2, Conn.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
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Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
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(Continued on page 334)

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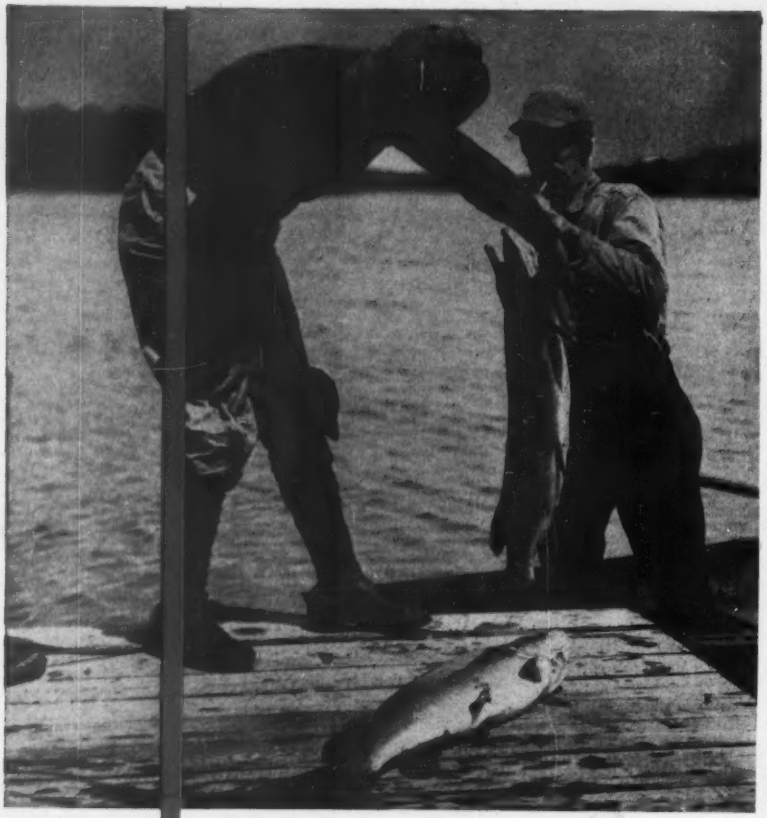

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Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Ex-Cell-O Corp., 1200 Onkman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
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Giddings & Lewis Mch. Tool Co., Fond du Lac, Wis.
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(Continued on page 336)

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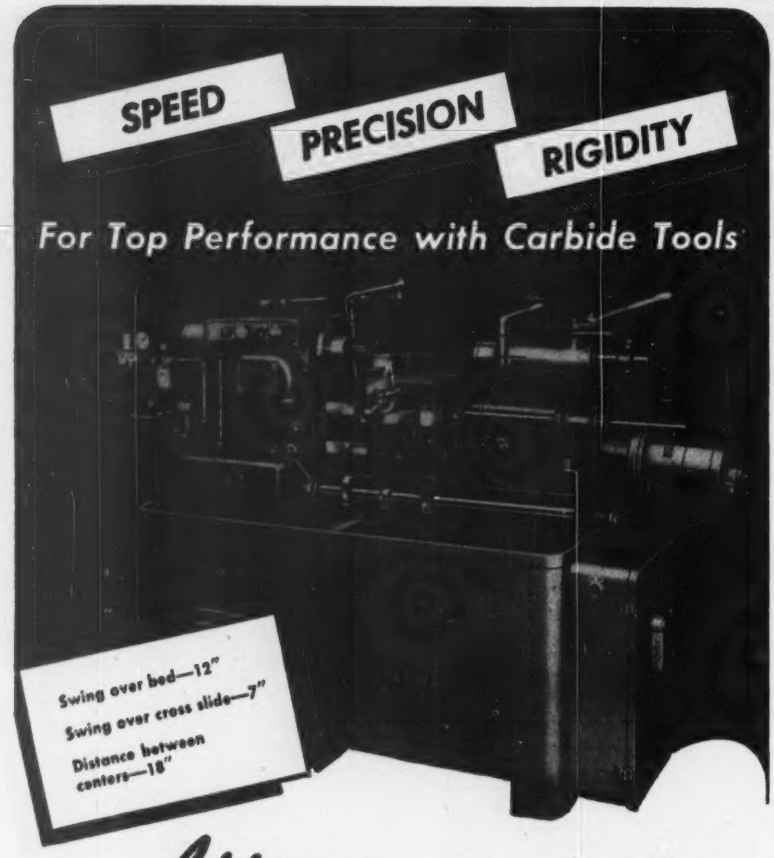

Lipe CARBO-LATHE

Designed to take full advantage of carbide tools, Lipe's Carbo-Lathe provides the high spindle speeds required for low-cost turning of non-ferrous metals, plastics, die-castings and other fast-cutting materials. What's more, it has the rigid massiveness, the even-flowing power, to take "hogging" cuts and feeds on high-Brinell steels, scaly surfaces, weld spots and jump cuts.

There are 315 speed changes in all—ranging from 95 rpm in low gear to 1978 in high. As for precision, every Carbo-Lathe is tested to .0015" accuracy overall on an 18" piece. Finish lacks the chatter marks of spur gear lathes and resembles a ground surface. Extreme rigidity coupled with the smoothness of worm gear drive insures freedom from torsional deflection, taper and out-of-round.

Push-Button Efficiency

Lipe Carbo-Lathe is available either with the Automatic Electric Cycle Attachment shown above, or with special cycle arrangement to suit your specific requirements. Minimizes operator motions, limiting them to loading and unloading the machine and pressing a button. You get more output per man and machine . . . can convert to the economies of battery operation. Attachment sold separately—may be installed on any Carbo-Lathe bearing a serial number of 200 and up.

Write for full information and delivery dates.
Send for free folder on Cycle Attachment.

Lipe-ROLLWAY CORPORATION
Manufacturers of Automotive Clutches and Machine Tools
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Lovejoy Tool Co., Inc., Springfield, Vt.
Madison Mfg. Co., Muskegon Heights, Mich.
Maxwell Co., 420 Broadway, Bedford, Ohio.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Metal Carbides Corp., Youngstown, Ohio.
OK Tool Co., Milford, N. H.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Universal Engineering Co., Frankenmuth 2, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

BRAKES, Press and Bending

Bath, Cyril, Co., 6984 Machinery Ave., Cleveland 3, Ohio.
Bliss, E. W., Co., 1375 Raff Road, S. W., Canton, Ohio.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Crane & Engrg. Co., Wickliffe, Ohio.
Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Ferracute Machine Co., Bridgeton, N. J.
Peck, Stow & Wilcox Co., Southington, Conn.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

BROACHES

American Broach & Mch. Co., Ann Arbor, Mich.
Carboloy Dept., General Electric Co., Box 237 Roosevelt Park Annex, Detroit 32, Mich.
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.
Detroit Broach Co., 20201 Sherwood Ave., Detroit, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.
Lapointe Mch. Tl. Co., Tower St., Hudson, Mass.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

BROACHING MACHINES

American Broach & Mch. Co., Ann Arbor, Mich.
Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.
Lapointe Mch. Tl. Co., Tower St., Hudson, Mass.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Wilson, K. R., 215 Main St., Buffalo, N. Y.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

BRONZE

American Brass Co, Waterbury 20, Conn.
Bunting Brass & Bronze Co., Spencer and Cerlton Aves., Toledo, Ohio.
Chase Brass & Copper Co., Inc., 1949 Rodney St., Waterbury 20, Conn.
Johnson Bronze Co., New Castle, Pa.

BRUSHES, Industrial, Wire Wheel, Etc.

Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, Ohio.

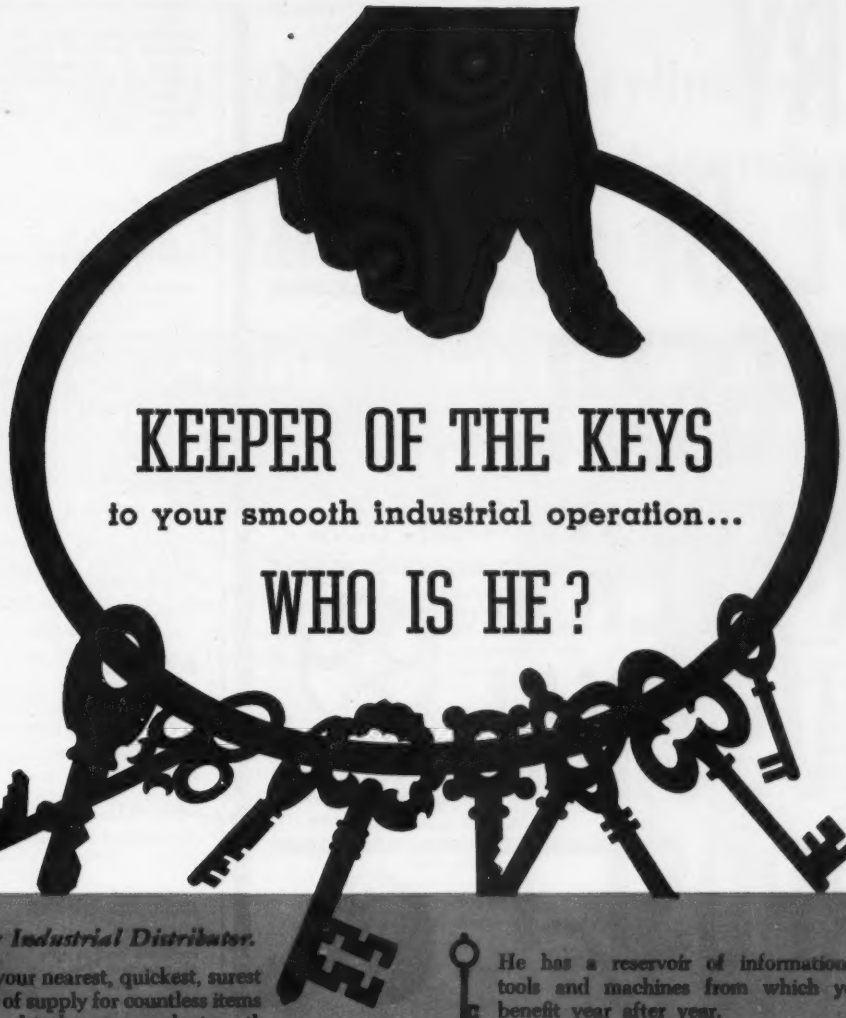
BUFFERS

Black & Decker Mfg. Co., E. Penna. Ave, Towson, Md. (Portable Elec.).
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.

BULLDOZERS

Ajax Mfg. Co., Euclid, Cleveland 17, Ohio.
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Atrax Co., Newington, Conn.

(Continued on page 338)



KEEPER OF THE KEYS

to your smooth industrial operation...

WHO IS HE?

He is your Industrial Distributor.

He is your nearest, quickest, surest source of supply for countless items you need to keep your plant on the go.

He carries a myriad assortment of tools, machines, parts, accessories and manufacturing staples—in the right types, designs, grades and sizes you require.

He is able to deliver them to you in less time than it would usually take for you to order and obtain them from their original source.

He warehouses huge stocks—many of them items of long-interval demands which otherwise would tie up your own capital (or expose you to the risk of shut-down, interruption or slow-up).

He knows where and how to obtain scarce or sorely needed operating requisites—thus sparing you the time, expense and tedium of searching for them yourself.

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He has a reservoir of information about tools and machines from which you can benefit year after year.

As a "clearing house" for all your plant-operating requisites within the foregoing scope, your Industrial Distributor can take over from you a lot of costly bookkeeping—and headaches.

By serving many industrial consumers he also serves many producers, thus reducing *their* "paper work" too... which consequently enables them to pass further savings along to you.

YES, the industrial distributing system has so many advantages to all who use it that it is an indispensable and valuable factor is the economics of free enterprise. Nicholson continues to subscribe to its principles in both words and action.

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PROVIDENCE, R. I. (IN CANADA, PORT HOPE, ONT.)

World's foremost manufacturer of
FILES FOR EVERY PURPOSE

EVERY TYPE OF CUT GEAR FOR EVERY INDUSTRIAL PURPOSE

CONTINUOUS-TOOTH HERRINGBONE GEAR
1" to 60" diameter, 16½ DP to 1½ DP and up to 20" face.

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1" to 58" diameter, from 24 DP to 1 DP.

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From ¼" to 150" diameter, 32 DP to ¼ DP and up to 30" face.

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From 1" to 72" diameter, 24 DP to 1½ DP and up to 20" face.

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BEVEL GEARS
(Straight Tooth)
From 1" to 60" diameter, 24 DP to ¾ DP.

ESTABLISHED 1888

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From 1" to 30" diameter, 24 DP to 1½ DP.

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Chambersburg Engrg. Co., Chambersburg, Pa.
Hufford Machine Works, Inc., 1700 E. Grand Ave., El Segundo, Calif.
Lake Erie Engineering Corp., Kenmore Station, Buffalo, N. Y.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

BURS

See Files and Burs, Rotary.

BUSHINGS, Brass, Bronze, Carbide, Etc.

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Johnson Bronze Co., New Castle, Pa.
Kennametal, Inc., Latrobe, Pa.

BUSHINGS, Hardened

Danly Machine Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
U. S. Steel Co., Inc., 436 7th Ave., Pittsburgh, Pa.

BUSHINGS, Jig

Colonial Bushings, Inc., P. O. Box 37, Harper Sta., Detroit, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Universal Engrg. Co., Frankenmuth, Mich.

CABINETS, Tool

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

CALIPERS

Ames, B. C., & Co. (Dial), Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Homestrand, Inc., Larchmont, N. Y.
Millers Falls Co., Greenfield, Mass.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass
Taft-Peirce Mfg. Co., Woonsocket, R. I.

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Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Fellows Gear Shaper Co., Springfield, Vt.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

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Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Landis Tool Co., Waynesboro, Pa.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Rowbottom Machine Co., Sheffield St., Waterville, Waterbury, Conn.

CAMS

Eisler Engrg. Co., Inc., 760 S. 13th, Newark 3, N. J.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Rowbottom Machine Co., Sheffield St., Waterville, Waterbury, Conn.

(Continued on page 340)

why HANNIFIN series "N" cylinders are the recognized standard of the hydraulic industry

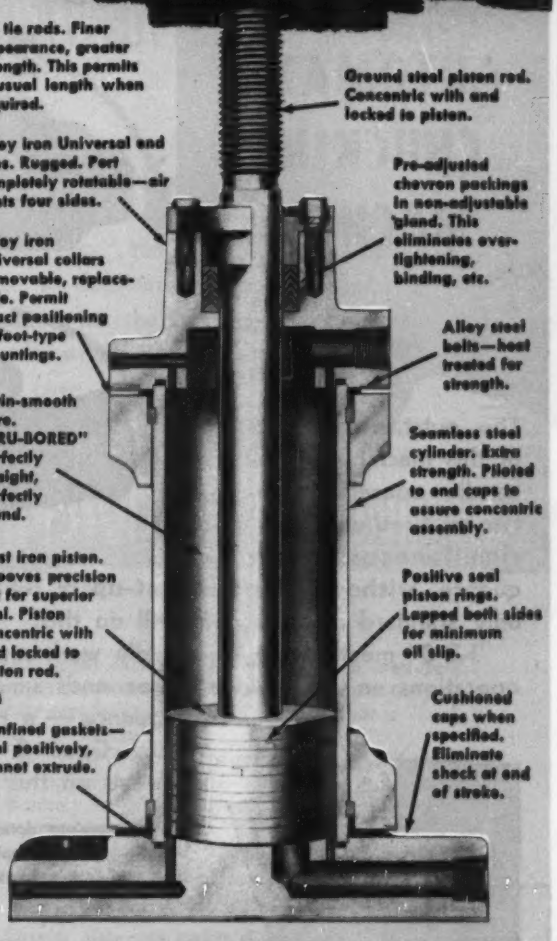
THE MOST COMPLETE STANDARD LINE

Hannifin is your single source for the broadest standard line of hydraulic cylinders on the market. When you need hydraulic cylinders, you'll save time and money by selecting from the complete Hannifin line.

- 12 bore sizes, 1" to 8"
- 11 standard mountings—more than 65 combination mountings
- No tie rods; ideal for long-stroke applications
- Cushioned and non-cushioned
- Double end piston rods available in most styles
- Bodies of heavy-walled steel tubing "TRU-BORED" and honed

WRITE FOR BULLETIN 110
Complete specifications and dimensions

DESIGNED AND BUILT FOR SUPERIOR PERFORMANCE LONGER LIFE

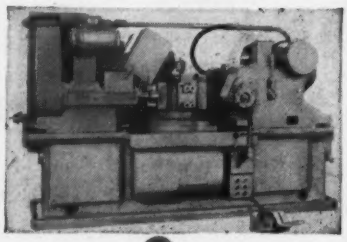

No tie rods. Finer appearance, greater strength. This permits unusual length when required.
Ground steel piston rod. Concentric with and locked to piston.
Alloy iron Universal end caps. Rugged. Port completely rotatable—air vents four sides.
Pre-adjusted chevron packings in non-adjustable gland. This eliminates over-tightening, binding, etc.
Alloy iron Universal collars Removable, replaceable. Permit exact positioning of foot-type mountings.
Alloy steel bolts—heat treated for strength.
Satin-smooth bore. "TRU-BORED" perfectly straight, perfectly round.
Seamless steel cylinder. Extra strength. Piloted to end caps to assure concentric assembly.
Cast iron piston. Grooves precision cut for superior seal. Piston concentric with and locked to piston rod.
Positive seal piston rings. Lapped both sides for minimum oil slip.
Confined gaskets—seal positively, cannot extrude.
Cushioned caps when specified. Eliminate shock at end of stroke.

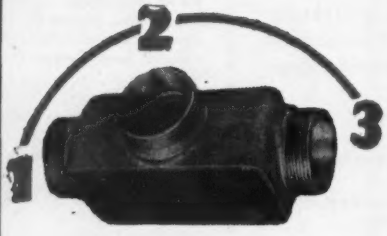
HANNIFIN

HANNIFIN CORPORATION • 1109 S. KILBOURN AVE., CHICAGO 24, ILLINOIS

AIR AND HYDRAULIC CYLINDERS • HYDRAULIC POWER UNITS • PNEUMATIC AND HYDRAULIC PRESSES • AIR CONTROL VALVES

Here's what is meant by "1-2-3" in the GOSS & DeLEEUW AUTOMATIC CHUCKING MACHINE





The outstanding advantage of this machine is ability to handle operations on one, two or three ends of a piece simultaneously or in sequence, **without changing set-up** or rehandling. It is the only standard machine that will do this.

"1-2-3" means ability to handle work requiring machining operations on one, two or three ends simultaneously or in sequence — a method exclusive with Goss & DeLeeuw and offered on this machine.

For complete details ask for illustrated bulletin. Send samples of your work for time and cost estimates.

GOSS & DeLEEUW QUALITY PRODUCT-QUANTITY PRODUCTION

GOSS and DeLEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

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Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Wesson Metal Corp., Lexington, Ky.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

CASEHARDENING FURNACES

See Furnaces, Heat-Treating.

CASTINGS, Aluminum, Brass, Bronze, Magnesium, Etc.

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co. (Brass and Bronze only), Bethlehem, Pa.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.

CASTINGS, Die

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.
American Brass Co., Waterbury 20, Conn.
Madison-Kipp Corp., Madison, Wis.

CASTINGS, Iron

Bethlehem Steel Co., Bethlehem, Pa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Chambersburg Engineering Co., Chambersburg, Pa.
Hansell-Elcock Co., 485 W. 23rd Place, Chicago 16, Ill.
Link-Belt Co., 180 W. Duncannon Ave., Philadelphia 20, Pa.

CASTINGS, Steel, Alloys, Etc.

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Lebanon Steel Foundry, Dept. J, Lebanon, Pa.
Link-Belt Co., 180 W. Duncannon Ave., Philadelphia 20, Pa.
U. S. Steel Corp., Columbia Steel Co., Div., 436 7th Ave., Pittsburgh, Pa.

CEMENT, Disc Grinding Wheel

Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

CENTERING MACHINES

Consolidated Mch. Tool Corp., Rochester, N. Y.
Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Jones & Lamson Mch. Co., Springfield, Vt.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.
Triplex Machine Tool Corp., 75 West St., New York 6, N. Y.

CENTERS, Lathe

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Jergens, J. G., Co., 11106 Avon Ave., Cleveland 5, Ohio.
Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.

(Continued on page 342)

Aesop's Fable of

"The Eagle and the Crow"

carries a moral for Cutting Fluid users

The Fable . . .

A Crow, sitting on a fence post, watched a huge Eagle swoop down on a luckless lamb and carry it away. "That looks easy", thought the Crow, and straightaway tried to duplicate the Eagle's feat. Of course, he couldn't lift the lamb and, instead, got tangled up in its wool and couldn't get loose. The farmer came over, grabbed the Crow, and wrung its foolish neck.

The Moral . . .

Just as there was a big difference in abilities of, and results secured by, the Eagle and the Crow in the fable, so are there big differences in the abilities of basically different types of cutting fluids. Stuart Oil Co., recognizing this, does not attempt to apply a watermixed cutting fluid where a straight oil is needed, or vice versa. Some applications require a fluid with great *lubricity*, on others high *anti-weld* properties are necessary. All require *temperature regulation*, but always *more than a "coolant" is needed.*

Let your Stuart Representative demonstrate the opportunities for increased machining efficiency in your plant. Ask to have him call at your convenience.

More Than a "Coolant" is Needed

D. A. Stuart Oil Co.
EST 1865 LIMITED

TIME-TESTED CUTTING FLUIDS AND LUBRICANTS

2739 S. Troy St., Chicago 23, Ill.

Free! Dilut-o-graph

Circular slide rule makes dilution of cutting fluids quick, easy! For tanks of 1 to 100 gallons. Fill in coupon, clip to your company letterhead and mail to:

D. A. STUART OIL CO.
2739 S. Troy St., Chicago 23, Ill.

Name .....

Title .....

Easily adjustable head and table speeds changeover from job-to-job...

New Heavy-Duty Alfing Drill Press

Immediate delivery from stock

Just turn the crank to raise or lower the table—slide the headstock 6" up or down by hand—lock in position—and the Alfing Drill Press is ready to go to work on your short- or long-run heavy duty production jobs. Easy-to-reach controls cut your handling time, too.

Built to take it, the Alfing Model BK-25 combines all the operating advantages that made it one of Europe's top producers for 40 years, *plus* many new design features to meet the operating requirements of American mass-production...like these:

Adjustable table and headstock. Scraped ways assure accurate alignment.

9" quill-supported spindle stroke, driven by V-belt motor.
Motor speed 900 rpm.

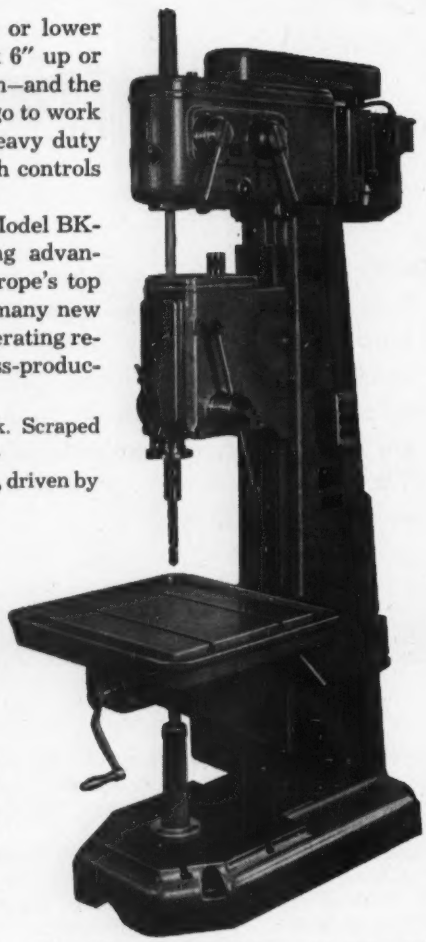
Drilling capacity of 1" in steel; 1¼" in cast iron.

Adaptable for boring, countersinking, milling and reaming.

8 spindle speeds from 150 to 1640 rpm in geometrical progression. Spindle carried in precision ball bearings.

Drilling feed by hand or power. With power, feeds of .003", .006" or .009" per spindle revolution are available. Power feed may be engaged or disengaged at any position of spindle. Drilling depth set by quick indexing stop.

Want more details on this and other Orban equipment? Write today.



New Alfing BK-25 Drill Press with 26" x 28" table surface. Distance between spindle and table, 23" max.; spindle and base plate, 25"-40". Scraped base plate may be used as table for extremely bulky work pieces. 3½ h.p. motor.

Engineered servicing and stock parts within 48 hours from Orban Service Centers in Newark, Detroit, Cleveland

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19450 James Couzens Highway, Detroit 35 - 1939 Santa Fe Ave., Los Angeles
Canadian sales by European Machinery Ltd., 11 King St. West, Toronto, Can.

Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

CHAINS, Power Transmission and Conveyor

Boston Gear Works, 3200 Main St., North Quincy, Mass.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa.

CHISELS AND CHISEL BLANKS

Bethlehem Steel Co., Bethlehem, Pa.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.

CHUCKING MACHINES

Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Goss & DeLeeuw Mch. Co. (Multiple Spindle), Kensington, Conn.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
National Acme Co. (Multiple Spindle), 170 E. 131st St., Cleveland, Ohio.
Potter & Johnston Co., 1027 Newport Ave., Pawtucket, R. I.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

CHUCKS, Air Operated

Cushman Chuck Co., Windsor Ave., Hartford 2, Conn.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Hufford Machine Works, Inc., 1700 E. Grand Ave., El Segundo, Calif.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.
Schrader's Son, A., 470 Vanderbilt Avenue, Brooklyn, N. Y.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
Tomkins-Johnson Co., Jackson, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

CHUCKS, Collet or Split

See Collets.

CHUCKS, Diaphragm

Van Norman Co., 2640 Main St., Springfield 7, Mass.
Woodworth, N. A., Co., 1300 E. Nine Mile Rd., Detroit 20, Mich.

CHUCKS, Drill

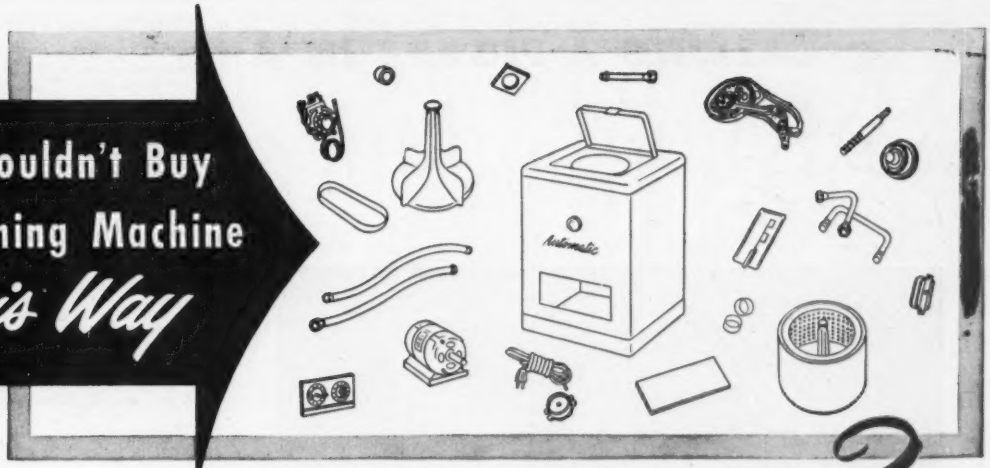
Erickson Tools, Div. Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Ettco Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Jacobs Mfg. Co., West Hartford, Conn.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.

CHUCKS, Full Floating

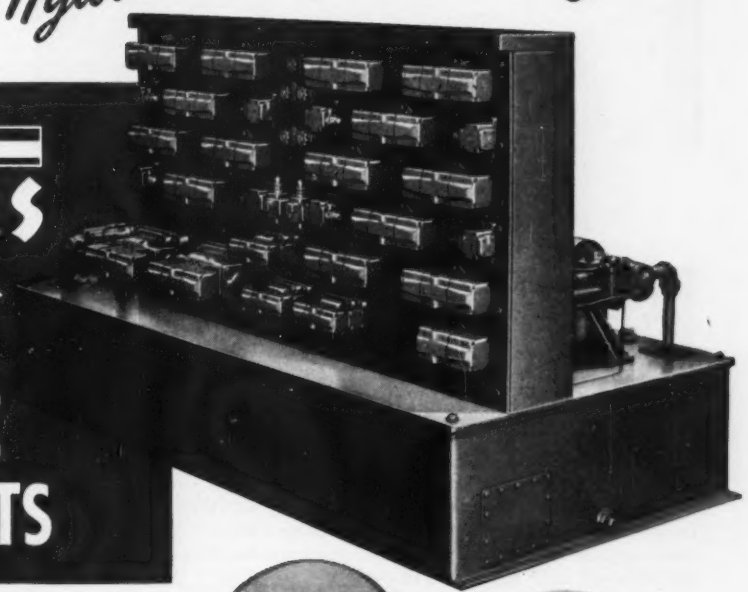
Erickson Tools, Div. Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, Staten Island, N. Y.
Gisholt Mch. Co., Madison 10, Wis.
Universal Engineering Co., Frankenmuth 2, Mich.

(Continued on page 344)

You Wouldn't Buy a Washing Machine *This Way*



Then Why Buy Hydraulics Piecemeal?



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You would never go to the trouble of buying automatic washing machine parts and assembling them yourself. It would take a lot of time and patience and trouble. For one thing the maker could not risk guaranteeing the finished job. You buy a washing machine as a unit, and want the undivided responsibility of the manufacturer.

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Hydraulic design is simplified and improved, and you save substantially on installation and maintenance cost. Vickers takes undivided responsibility for the entire hydraulic system and you get the benefit of Vickers skill and experience. These advantages are important to both the machine builder and his customer.

Ask the nearest Vickers factory-trained application engineer to send you new Bulletin 52-45 or to make a personal call.

Improve and Simplify Hydraulic Design

Reduce Installation and Maintenance Costs

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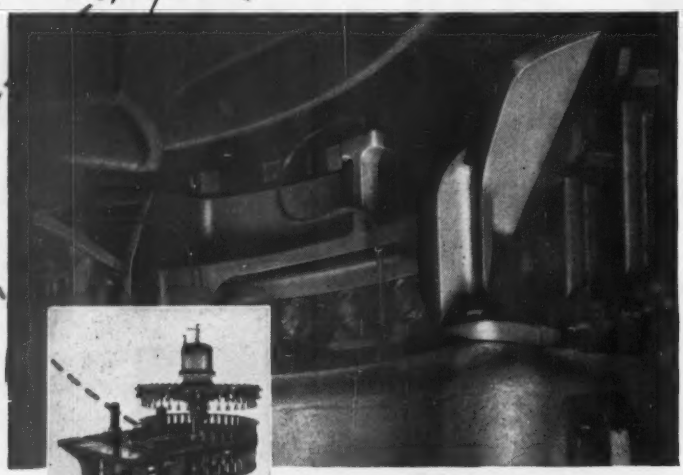
ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

CALLING A FIGURE IN A bottle dance



LEBANON CIRCLE L Castings ARE AT WORK

EVERYONE is fascinated by the sound and action of modern bottling machinery at work. It's the cams that "call the figures in this bottle dance"! And these cams have to be tough.

In Crown Cork & Seal Company's CEM 40 bottling machine, illustrated above, the sturdy cam is a Lebanon CIRCLE (L) special alloy steel casting. The efficiency of this machine that fills and caps many millions of soft drink bottles a year, is due in part, to the special wear and endurance properties built into the Lebanon Alloy Steel employed in casting the cam. The cam illustrated must hold its form and size, must keep wear to a minimum thereby eliminating expensive machine down-time.

Wherever castings are required, it's sound practice to use only the highest quality. Those bearing the CIRCLE (L) trade mark are high quality products of true Lebanon craftsmanship.

You should see . . .
STEEL WITH A THOUSAND QUALITIES

This 37 min., 16 mm. full color sound film showing the making of steel castings from blueprint to end use should be shown to your staff. For information write: Dept. X, Lebanon Steel Foundry, Lebanon, Pa.

LEBANON CIRCLE L Castings
CARBON, SPECIAL ALLOY AND STAINLESS STEEL
LEBANON STEEL FOUNDRY LEBANON, PA.

CHUCKS, Gear

Horton, E., & Son Co., Windsor Locks, Conn.
Woodworth, N. A., Co., 1300 E. Nine Mile Rd., Detroit 20, Mich.

CHUCKS, Lathes, Etc.

Buck Tool Co., 220 Schippers La., Kalamazoo, Mich.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Cushman Chuck Co., Windsor Ave., Hartford 2, Conn.
Erickson Tools, Div. Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Gisholt Mch. Co., Madison 10, Wis.
Jacobs Mfg. Co., West Hartford, Conn.
Jones & Lamson Mch. Co., Springfield, Vt.
Horton, E., & Son Co., Windsor Locks, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

CHUCKS, Magnetic

Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Hanchett Magna-Lock Corp., Big Rapids, Mich.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker, O. S., Co., Inc., Worcester, Mass.

CHUCKS, Power Operated

Skinner Chuck Co., 344 Church St., New Britain, Conn.

CHUCKS, Quick Change and Safety

Erickson Tools, Div. Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
Jarvis, Charles L., Co., Middletown, Conn.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Universal Engineering Co., Frankenmuth 2, Mich.

CHUCKS, Ring Wheel

Gardner Mch. Co., Div. Landis Tool Co., 414 E. Gardner St., Beloit, Wis.

CHUCKS, Tapping

Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
Homestrand, Inc., Larchmont, N. Y.
Jacobs Mfg. Co., West Hartford, Conn.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Skinner Chuck Co., 344 Church St., New Britain, Conn.

CIRCUIT-BREAKERS

General Electric Co., Schenectady 5, N. Y.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

CLAMPING APPLIANCES FOR MACHINE TOOLS

Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Standard Shop Equipment Co., Inc., 8299 W. Tinicum Ave., Philadelphia, Pa.
Swartz Tool Products Co., Inc., 13330 Foley Ave., Detroit, Mich.

CLAMPS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.

(Continued on page 346)

the RIGHT DRILL for Your Job

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Many years of scientific research, valuable experience and engineering knowledge have dictated the perfected designs and proper materials now incorporated in the complete line of Whitman & Barnes drills. There are individual drill designs and materials for producing best possible results when drilling ferrous and non-ferrous metals, plastics, glass, wood, stone, etc.

For faster, better and more economical drilling of holes in any material it will pay you to select a Whitman & Barnes drill that is specifically designed for the application.

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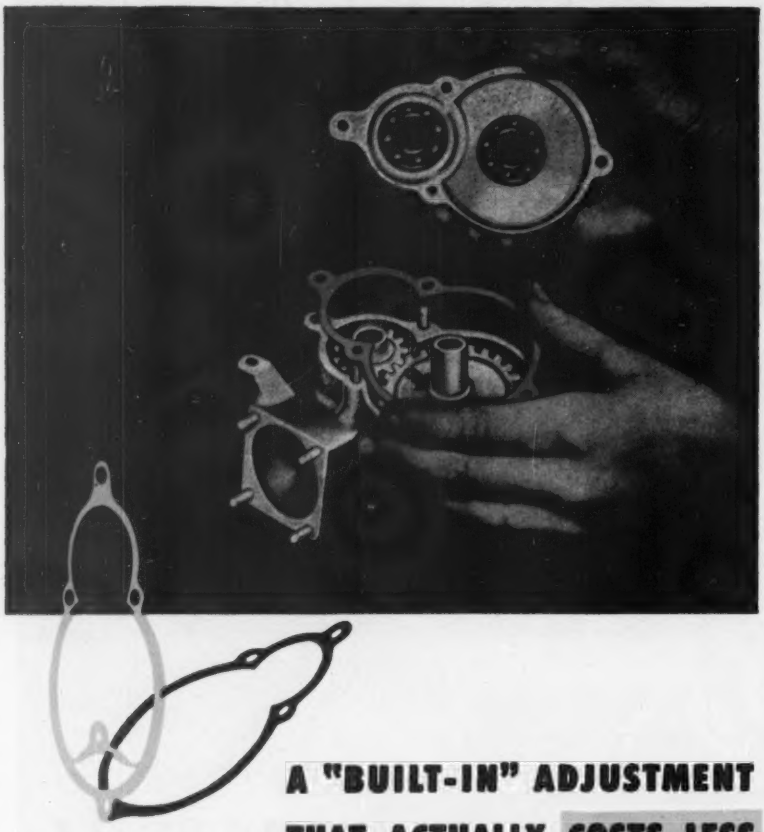


Shims stamped from LAMINUM® look like solid metal but actually are made up of from 3 to 63 layers of .002 or .003 inch brass or steel.

A "BUILT-IN" ADJUSTMENT THAT ACTUALLY COSTS LESS THAN NO ADJUSTMENT!

. . . there's less machining and you can "take up" after wear.

Think of this shim as an adjustment device. As used here, its cost was only 19¢. It's made of our exclusive LAMINUM®, has 16 layers of .002" brass in one unit.

It gives wide tolerances to the thrust gear housing, saving expensive machining time.

It precisely preloads the bearing. Inner race rests on the collar, marked by arrow. Outer race is "fixed" in the housing. Removal of a .002" shim lamination brings housing and outer race closer to main assembly. This gives the minute preloading adjustment for best angular contact bearing operation.

It "takes up" after wear. Removal of additional laminations makes simple, quick adjustment.

SHIM HEADQUARTERS SINCE 1913

Check Our Stampings Division For Your Stamped Parts Requirements

LAMINATED SHIM COMPANY, INC.

3904 UNION STREET • GLENBROOK, CONNECTICUT

DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Mead Specialties Co., 4114 N. Knox Ave., Chicago 41, Ill.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Standard Shop Equipment Co., Inc., 8299 W. Tinicum Ave., Philadelphia, Pa.
Starrett, The L. S., Co., Athol, Mass.
Swartz Tool Products Co., Inc., 13330 Foley Ave., Detroit, Mich.

CLEANERS, Chemical, for Metal

Bullard Co., Bullard-Dunn Process Div., Brewster St., Bridgeport 2, Conn.
Oakite Products, Inc., 19 Rector St., New York, N. Y.

CLUTCHES

Clearing Mch. Corp., 6499 W. 65th St., Chicago 38, Ill.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Formsprag Co., 23609 Hoover Rd., Van Dyke, Mich.
Link-Belt Co., 300 West Pershing Rd., Chicago 9, Ill.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Rockford Clutch Div., Borg-Warner Corp., 410 Catherine St., Rockford, Ill.
Twin Disc Clutch Co., 1361 Racine St., Racine, Wis.

COLLARS, Safety

Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.
Standard Pressed Steel Co., Jenkintown, Pa.

COLLETS

Brown & Sharpe Mfg. Co., Providence, R. I.
Erickson Tools, Div. Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Gisholt Mch. Co., 1245 E. Washington Ave., Madison 10, Wis.
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Tomkins-Johnson Co., Jackson, Mich.
Union Twist Drill Co., Athol, Mass.
Universal Engrg. Co., Frankenmuth 2, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

COMPARATORS

See Gages, Comparator.

COMPARATORS, Optical

DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Eastman Kodak Co., Rochester, N. Y.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Jones & Lamson Mch. Co., Springfield, Vt.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

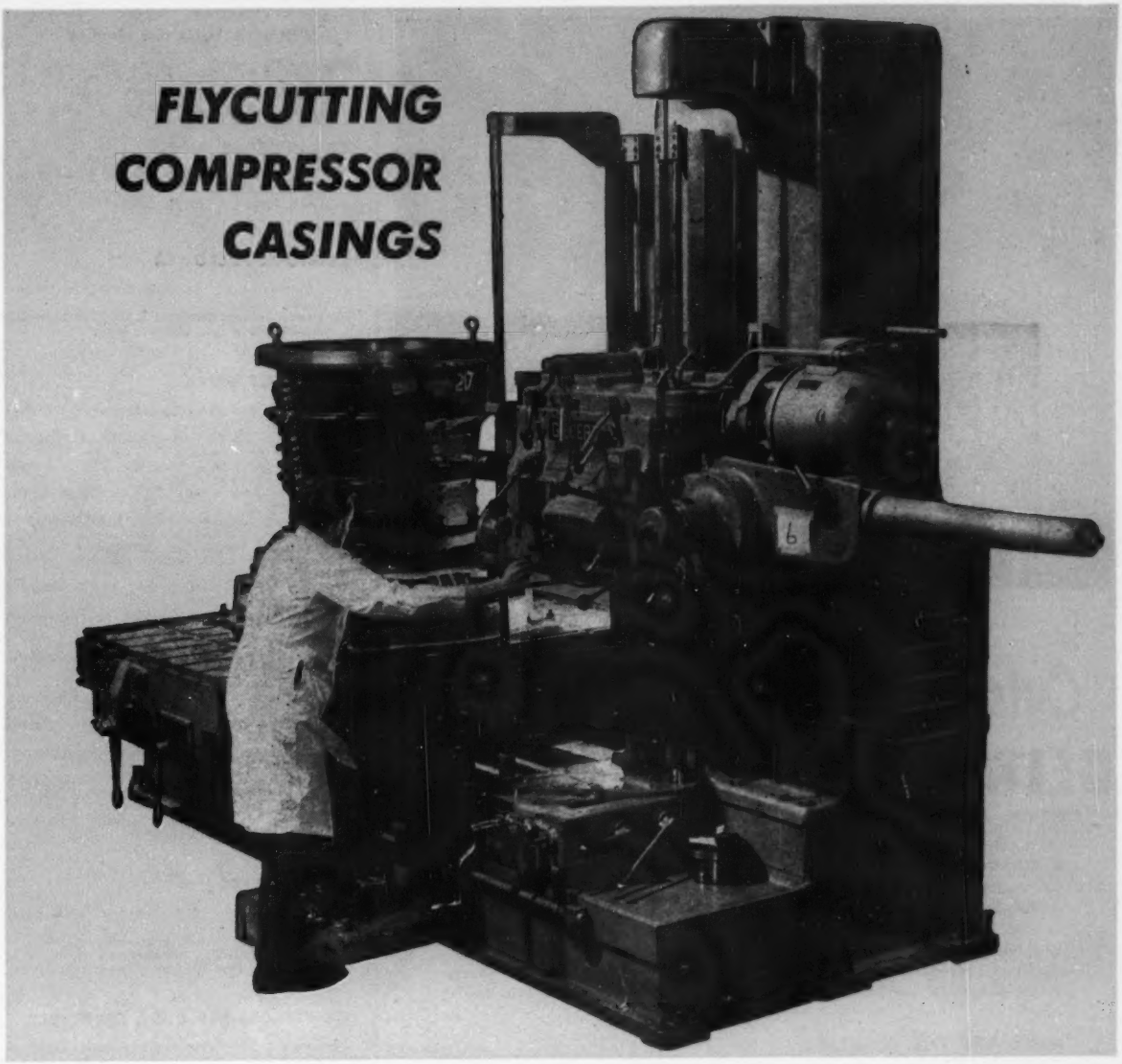
COMPOUNDS, Cleaning

Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Oakite Products, Inc., 19 Rector St., New York, N. Y.

COMPOUNDS, Cutting, Grinding, Metal Drawing, Etc.

Cities Service Oil Co., 70 Pine St., New York, N. Y.
Gulf Oil Corp., Gulf Bldg., Pittsburgh 30, Pa.
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich. (Broaching & Lapping).
Oakite Products, Inc., 19 Rector St., New York, N. Y.
Sinclair Refining Co., 630 5th Ave., New York.
Standard Oil Co. (Indiana) 910 S. Michigan, Chicago, Ill.
Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St., Chicago 23, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.
Tide Water Associated Oil Co., 17 Battery Place, New York, N. Y.

(Continued on page 348)



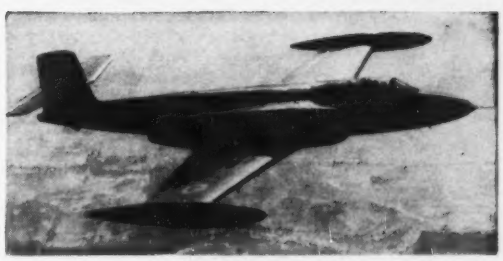
on the

ORENDA JET ENGINE

at A. V. Roe Canada, Ltd., Malton, Ont.

A total of ten Cincinnati Gilbert horizontal boring mills have been installed at A. V. Roe, and four more are on order. These fast modern machines fit the demand imposed by the Orenda Jet Engine production program: high production and accuracy in the extreme. They are delivering the kind of service that supports the statement: "Those who buy Gilbert buy Gilbert again."

Whatever your boring mill or radial drill requirements may be, you'll be well advised to investigate the productive capacity of Cincinnati Gilbert machines. Our representative is always at your service.



THE CINCINNATI

GILBERT

MACHINE TOOL COMPANY

3366 BEEKMAN STREET • CINCINNATI 23, OHIO

At Portable Electric Tools, Inc., Chicago, costs went down 25% when this Delta air-powered hydraulic drill unit went into production on body housing of PET ¼" portable electric drill.

Portable Electric Tools, Inc.

Cuts Production Costs 25% with DELTA Air Hydraulic DRILL UNITS

Portable Electric Tools, Inc., of Chicago combined two model 19-150 Delta Air-Powered Hydraulic Drill Units and a standard Delta drill press table to build a simplified, single-purpose production machine. Their aim was to increase unit production and cut operating costs.

The principal operation performed on this machine is the simultaneous boring of two brush holder holes in the PET "Super-Duty" ¼" portable drill body. Exacting accuracy is required because these holes are then used for locating the part for all other machining operations on the aluminum castings.

HERE ARE THE RESULTS:

"The Delta hydraulic drill unit has given us more than 25% production savings," says Walter Sundberg, Superintendent of Production Machining.

Tolerances held are plus .0005 and minus .0000.

Average output per hour, 150 bodies. No mechanical, service or maintenance problems, even when the machine has run three shifts for long periods.

Women workers with no previous experience operate the machine.

WHAT'S YOUR SPECIAL PROBLEM?

Delta air-powered hydraulic drill units can do for you what they've done for Portable Electric Tools, Inc. Your authorized Delta drill unit dealer will show you how to cut costs with this low-priced, high accuracy, high production drill unit. Our Catalog suggests many applications. Use the coupon.

DELTA MILWAUKEE

DELTA QUALITY MAKES THE DIFFERENCE

DELTA Quality Power Tools

Another Product of **Rockwell**

Delta Power Tool Division
ROCKWELL MANUFACTURING COMPANY
614D N. Lexington Ave., Pittsburgh 8, Pa.

☐ Please send me catalog AD-723

☐ Send name of nearest authorized Delta drill unit dealer.

Name.....

Position.....

Company.....

Address.....

City.....Zone.....State.....

COMPOUNDS, Resin and Molding

Bakelite Co., Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
General Electric Co., Schenectady 5, N. Y.

COMPRESSORS, Air

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.

CONTOUR FOLLOWER

Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Turchan Follower Machine Co., 8259 Livernois and Alaska Aves., Detroit, Mich.

CONTRACT WORK

Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.
Blanchard Mch. Co., 64 State St., Cambridge, Mass.
Columbus Die-Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
Diefendorf Gear Corp., 920 N. Belden Ave., Syracuse, N. Y.
Eisler Engrg. Co., Inc., 760 S. 13th, Newark 3, N. J.
Fellows Gear Shaper Co., Springfield, Vt.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland, Ohio.
Minster Machine Co., Minster, Ohio.
Morse Twist Drill & Mch. Co., New Bedford Mass.
Mummert-Dixon Co., Hanover, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
Wicaco Machine Corp., Stenton Ave. and Louden St., Philadelphia, Pa.

CONTROLLERS

Allen-Bradley Co., 1326 S. 2nd St., Milwaukee, Wis.
Bristol Co., Platts Mills, Waterbury, Conn.
General Electric Co., Schenectady 5, N. Y.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

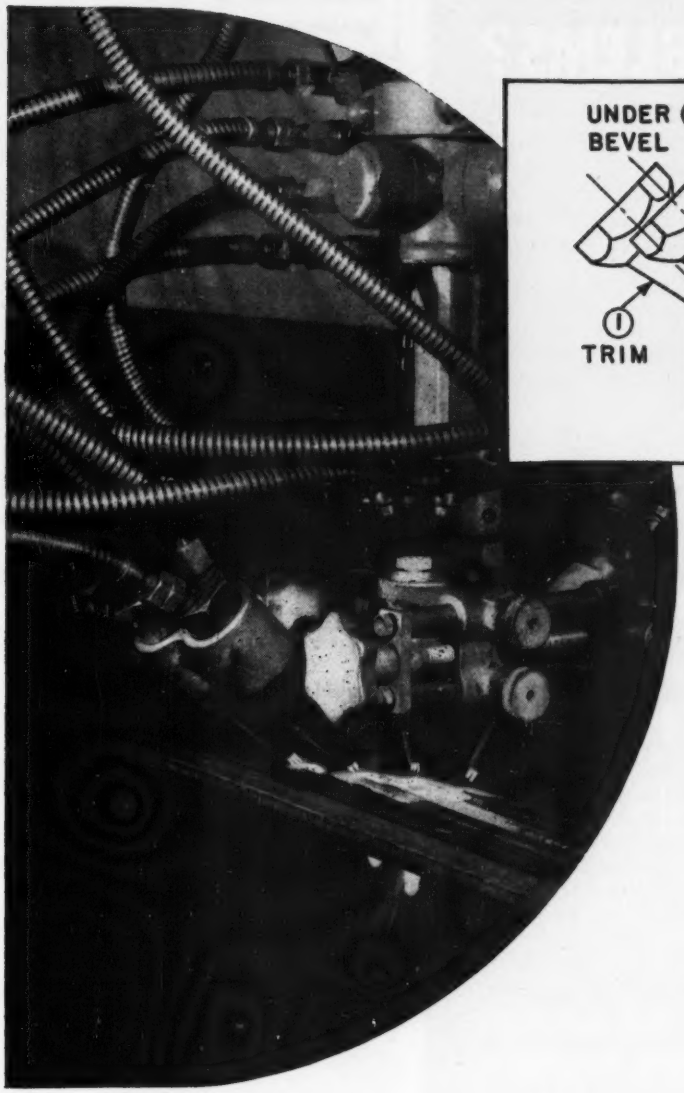
CONVEYORS FOR DUST, CHIPS, ETC.

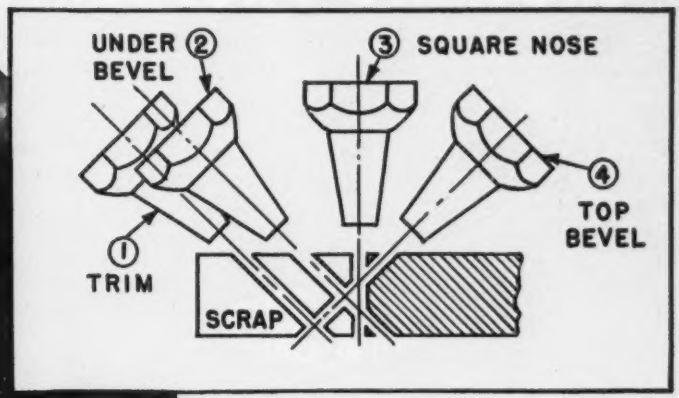
Link-Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.

COUNTERBORES

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Allen Mfg. Co., 133 Sheldon St., Hartford 2, Conn.
Besly-Welles Corp., Beloit, Wis.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal, Inc., Latrobe, Pa.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tool Co, Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Starrett, The L. S., Co., Athol, Mass.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Threadwell Tap & Die Co., 16 Arch St., Greenfield, Mass.
Union Twist Drill Co., Athol, Mass.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

(Continued on page 350)





One pass gets armor plate or *any* plate ready for welding

Swift-moving oxy-acetylene flames prepare steel plate edges for welding in a fraction of the time required by mechanical methods. Multiple nozzles, cutting in different planes simultaneously, slash with ease through any commercial thickness. *Just one pass to "finish" dimensions* turns out a square edge, single bevel, single bevel and nose, double bevel, double bevel and nose, or J-groove and nose. Edge preparation costs tumble; production booms.

LINDE'S oxygen-cutting methods are simple and flexible. They are economical and easy to use. They cut plates so smoothly and accurately that *no machining is necessary*—edges are ready to weld "as cut". Rigid fit-up and contour specifications are easily met. Yet, initial investment in OXWELD flame-cutting equipment is only a fraction of that for comparable machine tools. Upkeep over the years is extremely low.

On-the-job power needs are negligible. Reaction of cutting oxygen with hot steel does all the work. Only fractional horsepower is required to move the cutting nozzles along a straight line, radius, or any guided path over the line of cut.

For further details, telephone or write today. LINDE AIR PRODUCTS COMPANY, a Division of Union Carbide and Carbon Corporation, 30 E. 42nd St., New York 17, N. Y. Offices in Other Principal Cities. In Canada: Dominion Oxygen Company, Limited, Toronto.

The terms "Linde" and "Oxweld" are registered trade-marks of Union Carbide and Carbon Corporation.

Linde Trade-Mark

Products and Processes for MAKING, CUTTING, JOINING, TREATING, AND FORMING METALS

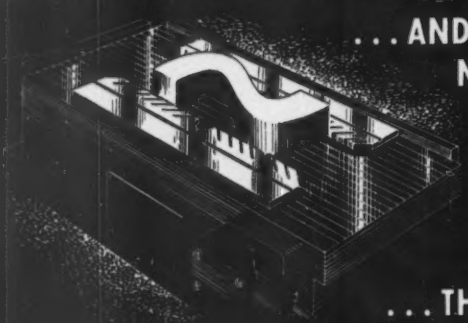
CHUCKING PROBLEMS?

...THE ANSWER IS

Magna-Lock electro-magnetic CHUCKS

Get details . . . WRITE DEPT. M-43

Rectangular . . . rotary . . . swiveling. Wide range of sizes and voltages. 22% more magnetic area . . . pieces held to extreme edges of chuck. Moisture-proof. Exclusive all-steel construction. Many other advantages.



...AND FOR HOLDING NON-MAGNETIC MATERIALS ON MAGNETIC CHUCKS

...THE ANSWER IS

Magna-Vise*

*patented

Magna-Lock is first to increase your machine's productivity

Hanchett MAGNA-LOCK CORPORATION

Magna-Lock

Magnetic Chucks and Devices

BIG RAPIDS, MICHIGAN, U. S. A.

COUNTERSHAFTS

Standard Pressed Steel Co., Jenkintown, Pa.

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Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Peck, Stow & Wilcox Co., Southington, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.

COUNTERS, Revolution

Bristol Co., Platts Mills, Waterbury, Conn.
Brown & Sharpe Mfg. Co., Providence, R. I.
Millers Falls Co., Greenfield, Mass.
Starrett, The L. S., Co., Athol, Mass.
Veeder-Root, Inc., 20 Sargent St., Hartford, Conn.

COUNTING DEVICES

Starrett, The L. S., Co., Athol, Mass.
Veeder-Root, Inc., 20 Sargent St., Hartford, Conn.

COUPLINGS, Flexible

Boston Gear Works, 3200 Main St., North Quincy, Mass.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.
Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa.
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

COUPLINGS, Shaft

Boston Gear Works, 3200 Main St., North Quincy, Mass.
Link-Belt Co., 2045 W. Huntington Park Ave., Philadelphia 40, Pa.
Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
Standard Pressed Steel Co., Jenkintown, Pa.

CRANES, Electric Traveling

Cleveland Crane & Engrg. Co., Wickliffe, Ohio.
Morgan Engrg. Co., Alliance, Ohio.

CUTTER GRINDERS

See Grinding Machines, for Sharpening Cutters, Reamers, Hobs, Etc.

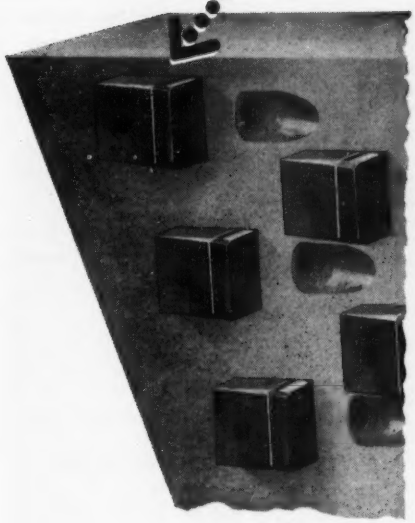
CUTTERS, Gear

Brown & Sharpe Mfg. Co., Providence, R. I.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 6, Mich.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.
Michigan Tool Co., 7173 E. McNichols Rd., Detroit 12, Mich.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich. (Shaving).
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tl. Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.
Waltham Mch. Wks., Newton St., Waltham, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

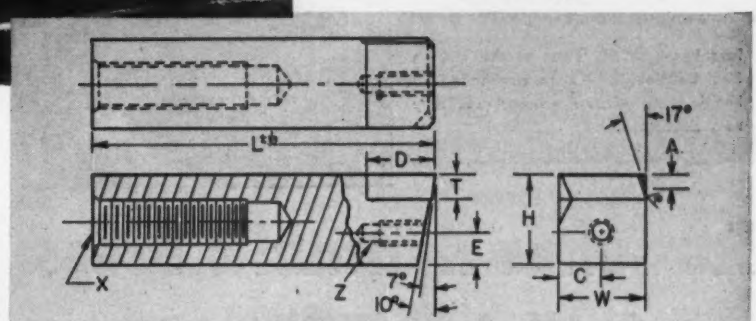
(Continued on page 352)

First again...

Firthite tipped Broach Tools for Off-the-shelf delivery!



FIRTHITE standard broach tools are carefully manufactured with special alloy steel shanks, drilled and tapped as shown in the dimensional drawing.



LEFT HAND	RIGHT HAND	W	H	L	T	D	A	C	E	X	Z
CBL-10	CBR-10	.610 .613	.613 .611	2¼	3/32	5/16	3/64	0	0	¼-20 N. C.	NONE
CBL-12	CBR-12	.735 .739	.737 .739	3	3/16	3/4	3/64	0	0	3/8-24 N. F.	NONE
CBL-16	CBR-16	.988 .983	.988 .986	3 13/16	¼	3/4	1/32	.500 .490	3/8	½-20 N. F.	¼-20 N.C.

3 Standard Sizes Available for High Production Broaches

Firth Sterling, always a leader in machine tooling progress, now offers *standard* broach tools for *off-the-shelf delivery* in the sizes and styles shown above.

This new addition to the constantly expanding line of standard Firthite Carbide Tools is the result of close cooperation with the builder of the huge new broaching machines used to machine the cylinder blocks of today's mass-produced automobile engines.

The proved performance of Firthite broach tools in this application, and the continuing demand for them, enables us to make stock items of these tools that help reduce costs and improve quality in the production line. Solid Firthite finishing blades are also quickly available.

Now, automobile and other manufacturers can keep broach tool inventories at a minimum and still be assured of prompt delivery when needed. Literature or engineering information is available, without obligation.

R-279

High Speed Steels • Tool & Die Steels • Stainless Specialties • High Temperature Alloys
Sintered Tungsten Carbides • Chromium Carbides • High Temperature Cermets • Firth Heavy Metal

Firth Sterling INC.

OFFICES* AND WAREHOUSES: HARTFORD NEW YORK* DETROIT CLEVELAND DAYTON* PITTSBURGH* CHICAGO BIRMINGHAM* LOS ANGELES PHILADELPHIA*

GENERAL OFFICES: 3113 FORBES ST., PITTSBURGH 30, PA.

Farquhar Hydraulic Press at the Weirton Steel Company straightens stopper rods. It has doubled production, required practically no maintenance.

Farquhar Hydraulic Press

at the Weirton Steel Co.

"eliminates breakage of rods...increases production 100%"

The Weirton Steel Co., Weirton, W. Va., formerly straightened stopper rods with a steam hammer. The operation was slow and resulted in a high percentage of breakage. Seeking a better method, Weirton officials bought a Farquhar Press to speed production. Not only has the press increased production 100%, but it has eliminated breakage of rods. In addition, Weirton reports that in the six years this press has been operating, "practically no maintenance has been necessary."

Farquhar Presses Cut Your Costs

Just one more example of cost-cutting Farquhar performance in modern production! Farquhar Presses are built for the job . . . assure faster production due to rapid advance and return of the ram . . . greater accuracy because of the extra guides on the moving platen . . . easy, smooth operation with finger-tip controls . . . longer life due to positive control of speed and pressure on the die . . . long, dependable service with minimum maintenance cost.

Farquhar engineers are ready to help solve whatever production problem you may have. Send for free catalog showing Farquhar Built-for-the-Job Presses in all sizes and capacities. Write to THE OLIVER CORPORATION, A. B. Farquhar Division, *Hydraulic Press Dept.*, 1504 Duke St., York, Pennsylvania.

Farquhar

HYDRAULIC PRESSES

for Bending • Forming • Forging • Straightening • Assembling • Drawing
Extruding • Swaging • Forging • and other Metalworking Operations

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Keo Cutters, 19326 Woodward, Detroit, Mich.
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Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

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Atrax Co., Newington, Conn.
Barber-Colman Co., Rock St., Rockford, Ill.
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Brown & Sharpe Mfg. Co., Providence, R. I.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Douglas Tool Co., 2300 E. Nine Mile Rd., Hazel Park, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Haynes Stellite Div, Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Kennametal, Inc., Latrobe, Pa.
Lovejoy Tool Co., Inc., Springfield, Vt.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tl. Co., Rochester, Mich.
OK Tool Co., Milford, N. H.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
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Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

CUTTERS, Rotary

See Files and Burs, Rotary.

CUTTING COMPOUNDS

See Compounds, Cutting, Grinding, Etc.

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Cities Service Oil Co., 70 Pine St., New York, N. Y.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Gulf Oil Corp., Gulf Bldg., Pittsburgh 30, Pa.
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Sinclair Refining Co., 630 5th Ave., New York, N. Y.
Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St., Chicago 23, Ill.
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Brown & Sharpe Mfg. Co., Providence, R. I.
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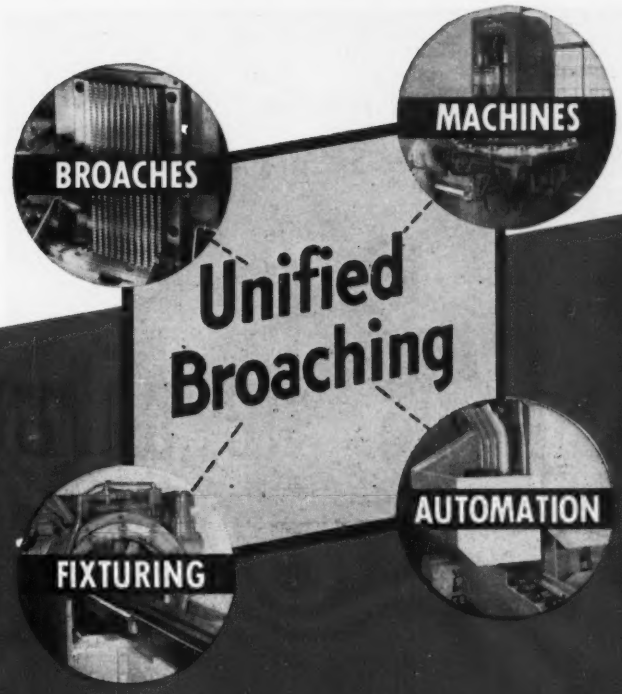
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Landis Machine Co., Waynesboro, Pa. (Pipe).
Modern Machine Tool Co., 601 S. Water St., Jackson, Mich. (Lathe Type for Tubing).

(Continued on page 356)



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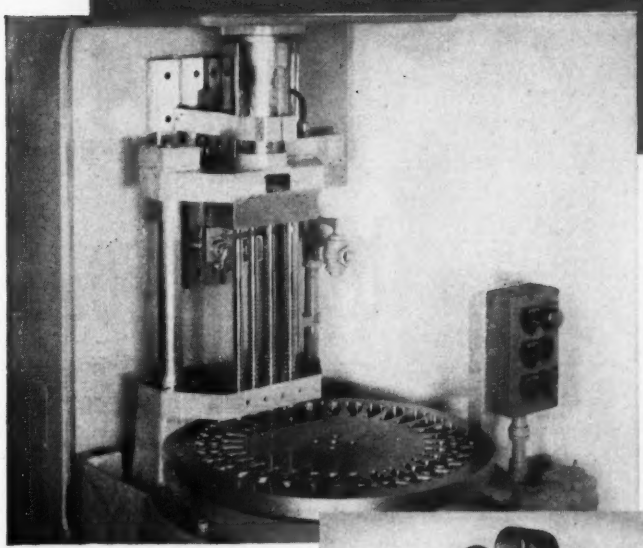
the COLONIAL method

At Colonial, experience, imagination and competence are applied

1 to the design and manufacture of each of the individual components of a complete broaching installation, and

2 to the effective combining of ALL components into a completely UNIFIED BROACHING installation—making them work as a "team."



Broach 1200 Rocker Arms per Hour

Continuous strip-broaching and burnishing of 1200 automotive rocker arms per hour is achieved with minimum effort by a Colonial 10-ton, 36 in. stroke Utility Press. Operator merely loads fixture as it indexes past him. Broached rocker arms simply drop through slots in indexing table and out of chute.

Rocker arms are broached four at a time, approximately 0.010" stock being removed. Burnishers on the broaches permit fast strip broaching with long tool life.

Machines, broaches, fixtures, etc., were all designed by Colonial as a UNIFIED BROACHING INSTALLATION.

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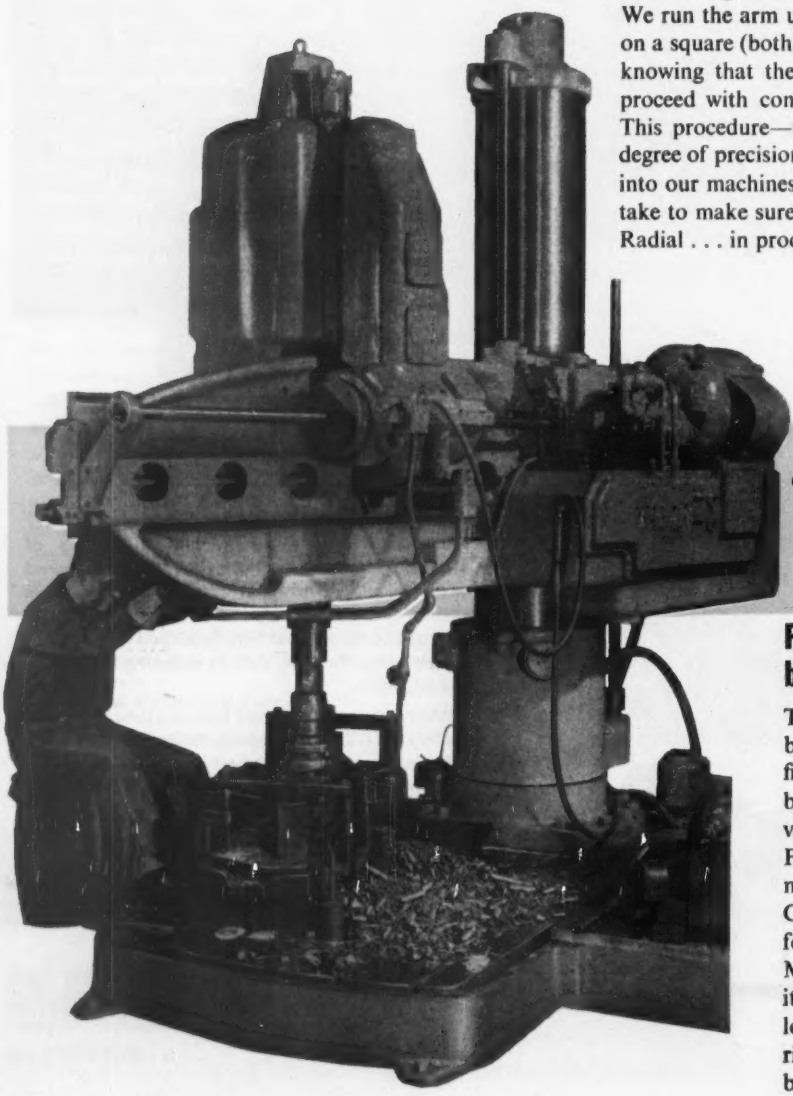
PIONEERS OF H.S.S. BROACHING

COLONIAL BROACH CO. DETROIT 13

Here's another reason it pays to get a proposal from Fosdick

Fosdick aligns the column

Radial alignment at Fosdick starts with the column. We run the arm up and down with an indicator bearing on a square (both lengthwise and across the base). Then, knowing that the column is square with the base, we proceed with conventional tramming and sweep tests. This procedure—used only by Fosdick—adds an *extra* degree of precision to the extra rigidity we have designed into our machines. It's another example of the pains we take to make sure you get the most out of your Fosdick Radial . . . in production, tool life, finish, tolerance.



Fosdick Hydraulic Radials are available with 3' to 8' arms, 11" to 19" columns. For full information, ask for Bulletin **HRM.**

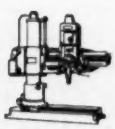
to give you

Fosdick takes a "bite" out of boring time at Owen Bucket

Tough cast-steel hinges for clamshell buckets are bored to ± .001" for a press-fit cast iron bushing—then counterbored for a washer. For this and a variety of other heavy-duty drilling, Fosdick's proposal on a 5' 17" Radial made sense. Now Owen Bucket Co. of Cleveland gets 10 pieces in the time formerly needed to produce 7. As Frank Matisak, General Superintendent puts it, " . . . now we can do more pieces with longer tool life—this machine is more rigid, giving us closer tolerances and better finish."

First precision production like this

Need Drilling Equipment? Get a Proposal from Fosdick!



Radial Drills

Jig Borers

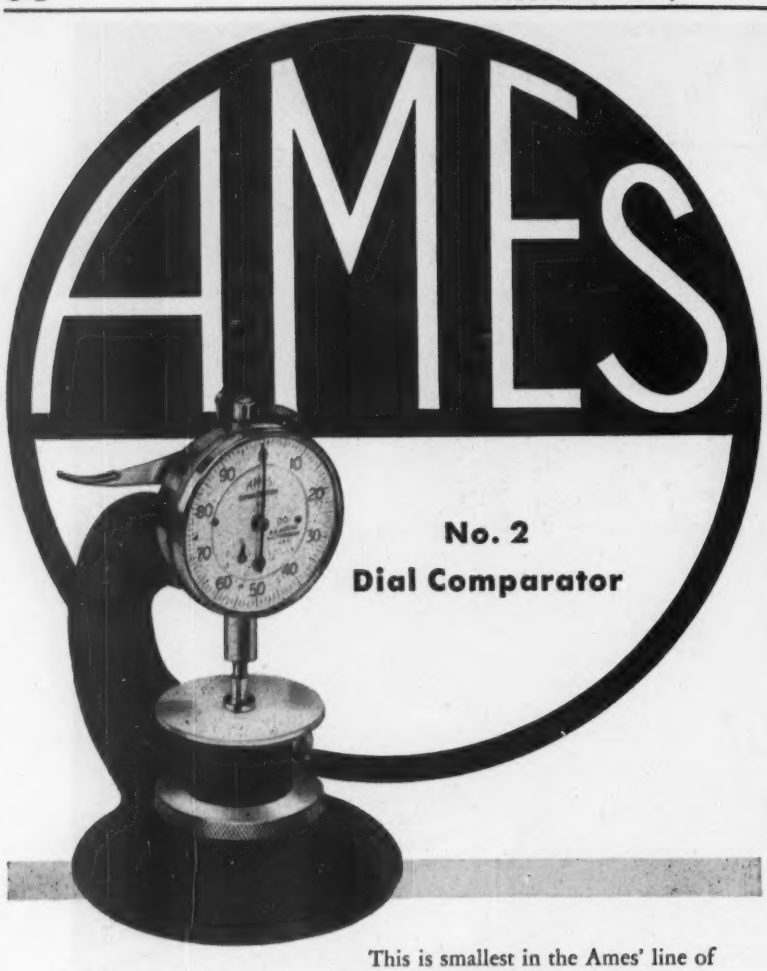
Sensitive and Upright Drills

Sensitive Radial Drills

Automatic Positioning Machines

FOSDICK

THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO



This is smallest in the Ames' line of high quality dial comparators and it is ideal for desk or bench use in the fine inspection of small precision parts. It is light in weight, but its broad base makes it very stable. The capacity approximates that of the regularly supplied Ames No. 202 Dial Indicator which has a dial numbered 0-100, graduated in .001" and with a .250" range. Should your job requirements differ, you can have the No. 2 with any Ames "Hundred Series" Dial Indicator. Send for Ames Catalog No. 58 covering the entire line of Ames Top Quality measuring instruments or, better still, send complete details of your Quality Control problem. Ames will suggest a solution – no obligation, of course.

Ames Long Range Dial Indicator No. 2822

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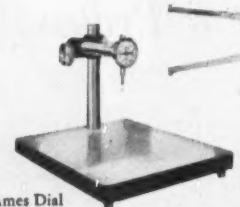
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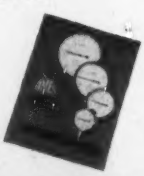
Ames Caliper Gauge No. 12B



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Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.
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(Continued on page 360)

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IF you have a B&D Tool that's not performing up to par, give it back the power, speed and accuracy with which it left the factory—with a fast, expert, economical repair job at the Black & Decker Service Branch nearest you!

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For service that saves on any B&D product, check the B&D Branch nearest you, listed below! THE BLACK & DECKER MFG. CO., 605 Pennsylvania Ave., Towson 4, Maryland.

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TUNGSTEN-CARBIDE

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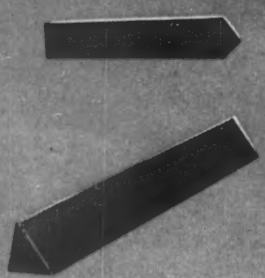
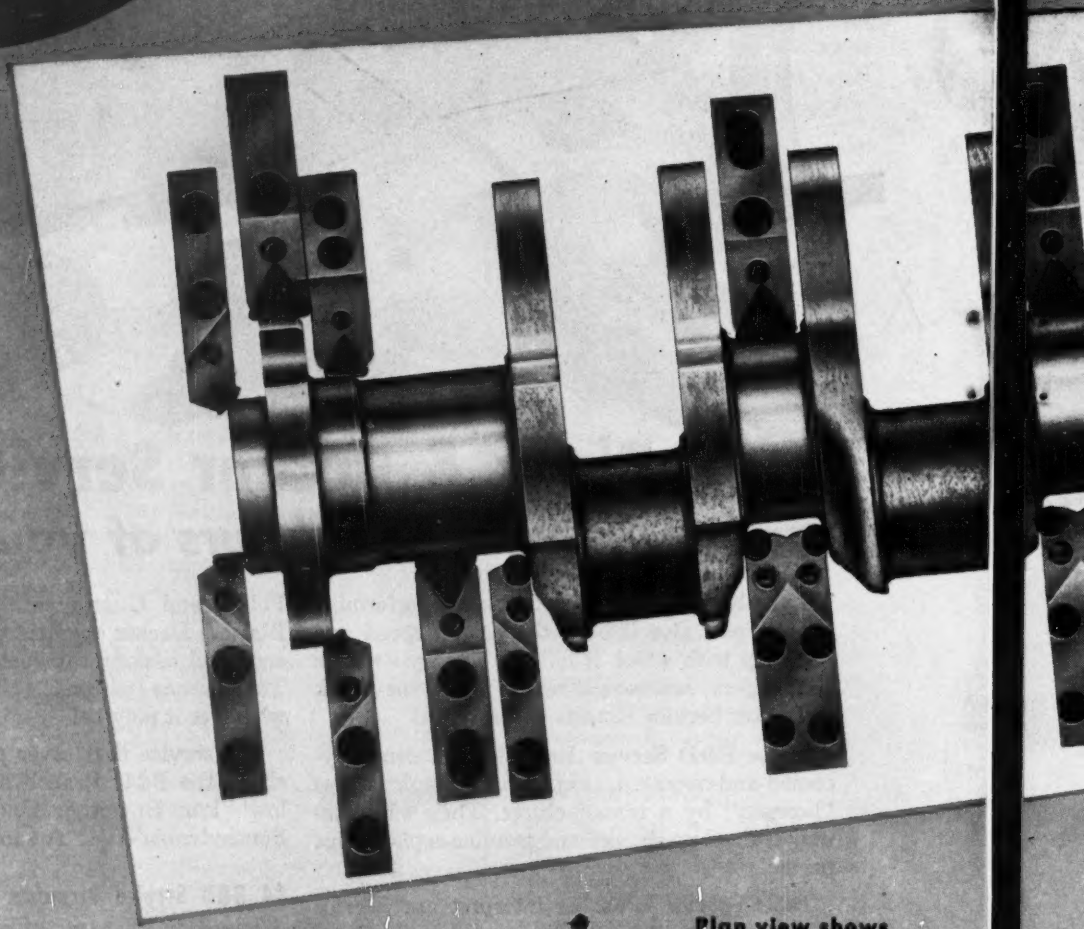
First.





Wessonmetal—the cemented carbide giving users phenomenal performance throughout industry—turns to new successes on this difficult crankshaft turning job. Look at the production increase, the increase in pieces per tool change, the long, more efficient tool life possible with Wessonmetal.

Plan view shows position of front and rear tools only.

WESSONMETAL

WESSON METAL CORPORATION
LEXINGTON 34, KENTUCKY

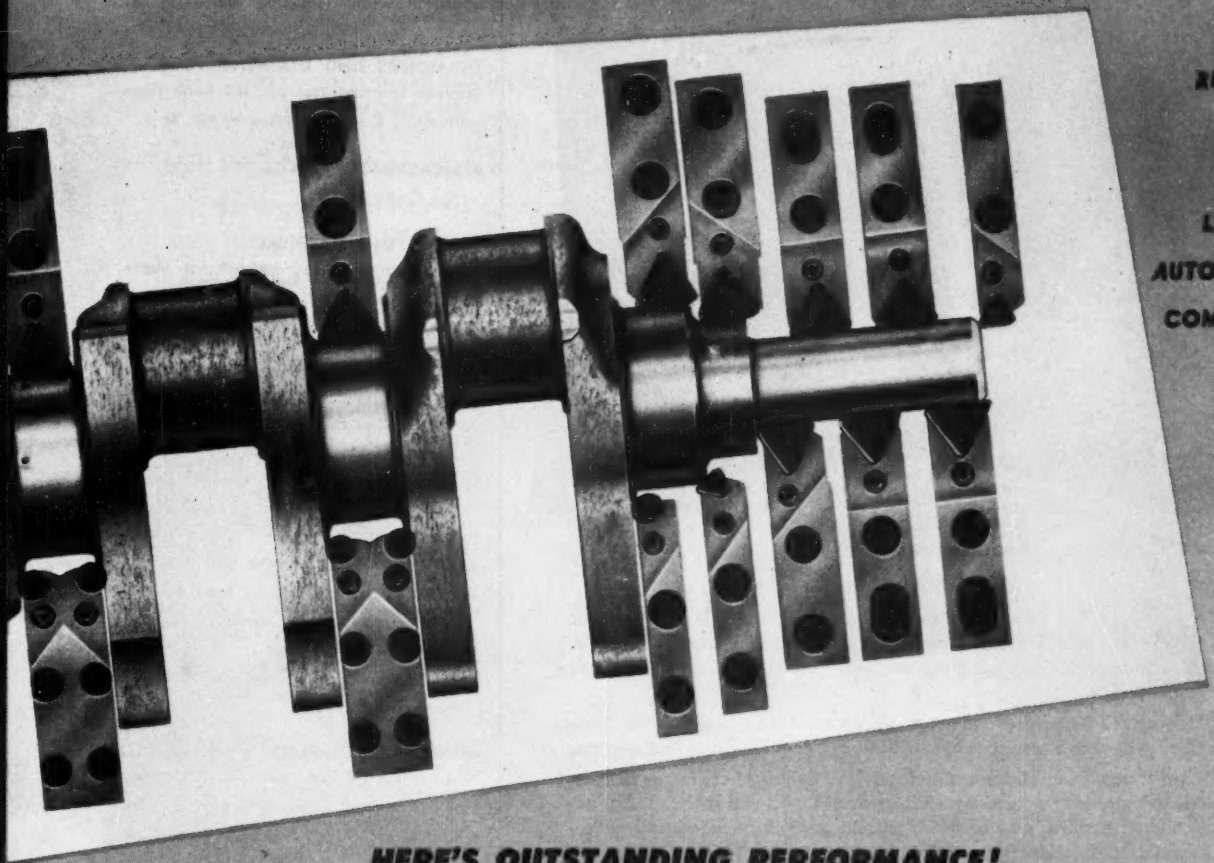
TO TURN CRANKSHAFTS

with CARBIDE INSERT TYPE TOOLS

USING WESSON BAND TYPE TOOL HOLDERS

and WESSONMETAL SOLID CARBIDE INSERTS

ON LeBLOND AND WICKES LATHES



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HERE'S OUTSTANDING PERFORMANCE!

AN AVERAGE OF 9000 PIECES PER INSERT BEFORE SHARPENING

OLD METHOD	NEW WESSON METHOD
Pieces . . . . . 11 per hour	Pieces . . . . . 48 pieces per hour
Cycle Time . . . . . 1 min. 55 seconds	Cycle Time . . . . . 40 seconds
Cranks per tool change (average) . . 1.7 pieces	Cranks per tool change (average) . . 1500 pieces

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MICRO A DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR COMPANY

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Detroit Die Set Corp., 2895A W. Grand Blvd., Detroit 2, Mich.
Producto Mch. Co., 990 Housatonic Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

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Precise Products Corp., 1328-30 Clark St., Racine, Wis.

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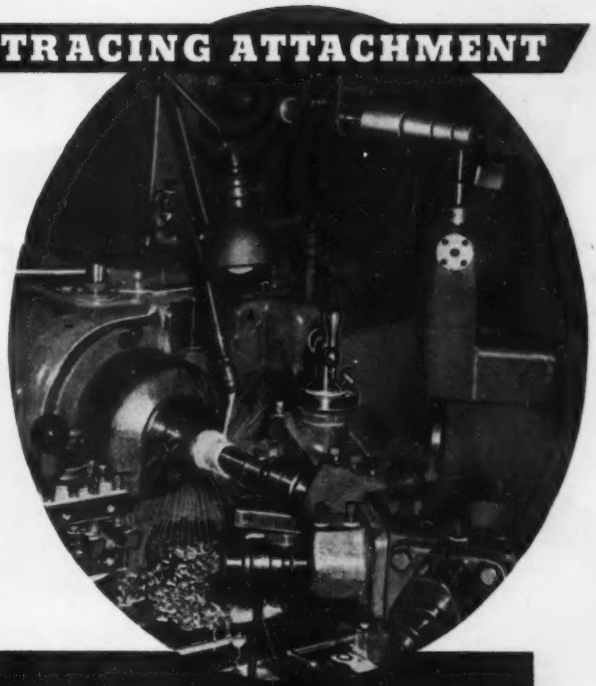
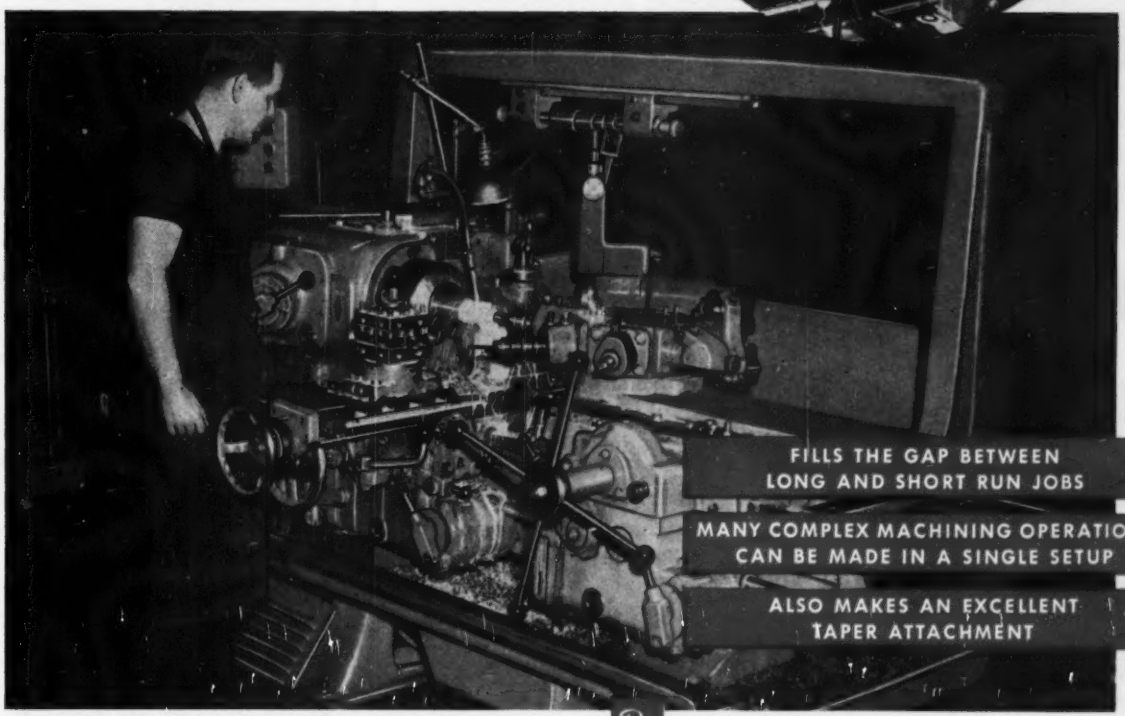
(Continued on page 362)

NEW HYDRAULIC TRACING ATTACHMENT

for J&L turret lathes*

Will reduce your costs — direct and indirect — by combining in a single machine all the advantages of TRACING for contour turning, boring or facing operations, with the advantages of multiple tooling and the many other time saving, cost saving features of J & L Universal Turret Lathes.





FILLS THE GAP BETWEEN LONG AND SHORT RUN JOBS

MANY COMPLEX MACHINING OPERATIONS CAN BE MADE IN A SINGLE SETUP

ALSO MAKES AN EXCELLENT TAPER ATTACHMENT

*RAM TYPE or No. 7 SADDLE TYPE

P.S. This attachment can be purchased with new machines or installed in the field on machines now in service. Write for descriptive leaflet giving complete specifications.

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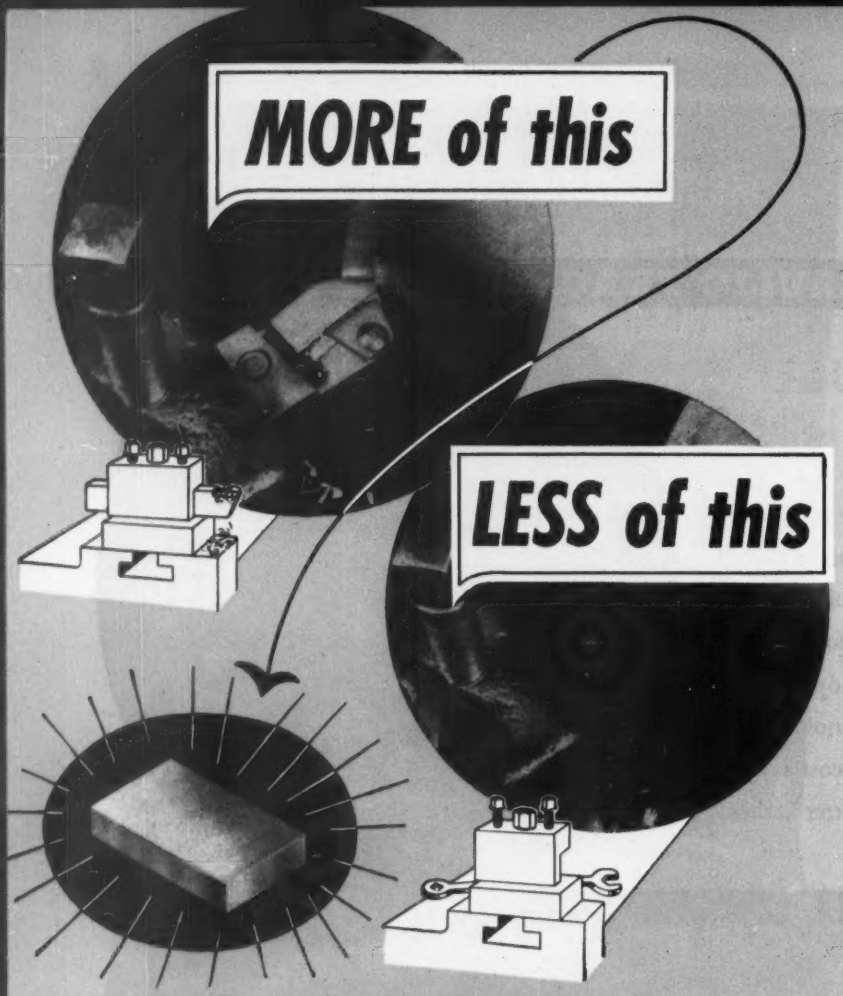

How to Reduce "LOST-BUT-PAID-FOR" HOURS

Shut down of a machine for tool change does not shut off operating expense. Production stops, but costs run on.

There's a way to minimize this non-productive time . . . Kennametal tools seldom need replacement — hours on the machine, minutes being reground.

Kennametal is "different" — ingredients, compositions, processing. The resultant distinctive characteristics are utilized to a maximum degree in novel tool designs — especially the clamped-on technique — in which we pioneered.

How Kennametal reduces Lost-but-Paid-for-Hours is disclosed by case studies in periodically-issued Performance Reports, and can be demonstrated in your own plant. Such information and help is yours for the asking. Kennametal Inc., Latrobe, Pa.

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CEMENTED CARBIDE TOOLING
THAT INCREASES PRODUCTIVITY

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Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
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Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Kearney & Trecker Corp., Milwaukee, Wis.

DIE STOCKS

See Stocks, Die.

DIES, Lettering and Embossing

Hoggson & Pettis Mfg. Co., 149 Brewery St., New Haven, Conn.

DIES, Sheet Metal, Etc.

Allied Products Corp., 12677 Burt Rd., Detroit 23, Mich.
Bath, Cyril, Co., 6984 Machinery Ave., Cleveland 3, Ohio.
Bliss, E. W., Co., 1375 Raff Rd., S. W, Canton, Ohio
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Chambersburg Engrg. Co., Chambersburg, Pa.
Columbus Die-Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Ferracute Mch. Co., Bridgeton, N. J.
John, B., Manufacturing Co., Ellis St., New Britain, Conn.
Metal Carbides Corp., Youngstown, Ohio.
Niagara Mch. & Tool Wks., 683 Northland Ave., Buffalo, N. Y.
Pioneer Pump & Mfg. Co., 19679 John R St., Detroit, Mich.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.
Waltham Mch. Wks., Newton St., Waltham, Mass.

DIES, Threading

Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Card, S. W., Mfg. Co., Mansfield, Mass.
Detroit Tap & Tool Co., Detroit, Mich.
Eastern Mch. Screw Corp., New Haven, Conn.
Geometric Tool Co., Westville Station, New Haven 15, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Threadwell Tap & Die Co., 16 Arch St., Greenfield, Mass.
Winter Bros. Co., Rochester, Mich.

DIES, Threading, Opening

Eastern Mch. Screw Corp., New Haven, Conn.
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
Geometric Tool Co., Westville Station, New Haven 45, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Landis Mch. Co., Waynesboro, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

(Continued on page 364)

Pressur-Forming

ASSURES A BETTER FIT, GREATER STRENGTH, LONGER LIFE

ALLEN'S specialized and perfected method of cold forging Allenoy steel produces the tremendous strength, fatigue resistance and precision that made Allen the *Number One* name in socket screws. Full "pressur-forming" preserves the tough Allenoy fibers continuous, uncut and concentrated where strength is needed most . . . conforming to the contours of screw head, socket and threads.

ALLEN PRESSUR-FORMING pays off in precision screws that you can count on to speed assembly, stand up better under continued hard usage. To be sure you get the advantage of "pressur-forming"—just remember to get genuine Allens, the easy name to remember because Allen *stands* for socket screws. The leading Industrial Distributor in your area stocks a complete line.

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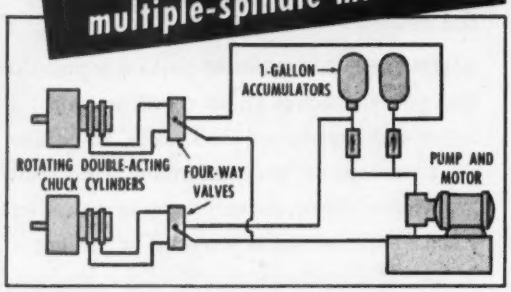
IMPACT for Chucking

GREER ACCUMULATORS deliver hydraulic SURGE on multiple-spindle machines



Functions Performed by **GREER ACCUMULATORS**

1. PRESSURE STORAGE CHAMBER to provide
   a. Main source of hydraulic power.
   b. Auxiliary power source.
   c. Emergency power source.
2. PRESSURE-VOLUME COMPENSATOR for
   a. Leakage compensation.
   b. Temperature compensation.
3. DISPENSER OF FLUIDS and Lubricants.
4. TRANSFER BARRIER for Fluids and Gases.
5. SHOCK ABSORBER to
   a. Absorb line shocks.
   b. Reduce pump pulsations.

Greer Accumulators deliver the hammer-like blow on the chuck jaws required to seize and release work on automatic multiple spindle machine tools. In the above simplified, schematic diagram the Greer Accumulator not only supplies power for actuating the chucks but also maintains line pressure for holding the work securely. A low-volume, high-pressure pump charges the accumulator during intervals between chucking. Without the accumulator, a pump to deliver the required surge of fluid would have to be so large and costly as to be economically impractical.

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Sheffield Corp., 721 Springfield, Dayton, Ohio.

DISCS, Abrasives

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Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Norton Co., 1 New Bond St., Worcester, Mass.
Simonds Abrasive Co., Tacony and Fraley Sts., Bridesburg, Philadelphia, Pa.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

DIVIDING HEADS

See Indexing and Spacing Equipment.

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Detroit Die Set Corp., 2895A W. Grand Blvd., Detroit 2, Mich.
Producto Machine Co., 990 Housatonic Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

DRAFTING MACHINES

Universal Drafting Mch. Corp., 7960 Lorain Ave., Cleveland, Ohio.

DRESSERS, Grinding Wheel

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Erickson Tools, Div. Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hoglund Engrg. & Mfg. Co., Inc., Berkeley Heights, N. J.
Metal Carbides Corp., Youngstown, Ohio
Meyers, W. F., Co., Bedford, Ind.
Moore Special Tool Co., Inc., 724 Union Ave., Bridgeport, Conn.
Norton Co., 1 New Bond St., Worcester, Mass.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Vinco Corp., 9113 Schaefer Hwy., Detroit 28, Mich.

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Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.

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Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburah 8, Pa.
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
Ettco Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Moline Tool Co., 102 20th St., Moline, Ill.
Thriftmaster Products Corp., 1076 N. Plum St., Lancaster, Pa.
United States Drill Head Co., 616 Burns, Cincinnati, Ohio.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

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(Continued on page 366)

EASY WAY TO HIT PEAK PRODUCTION!

In this well-known meter plant, as in hundreds of efficient shops, they're jacking up drilling output this simple way: install the easy-handling multiple spindle "Buffalo" Drills your operation requires. You not only eliminate waste setup motions, but you get better accuracy, less worker fatigue and longer drill life.

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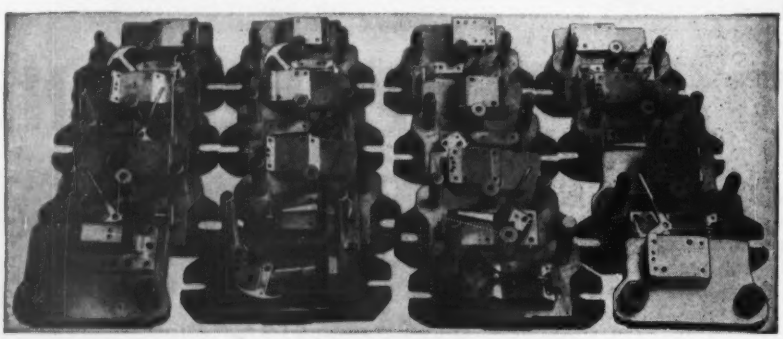

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Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Rehnberg-Jacobson Mfg. Co., 2135 Kishwaukee St., Rockford, Ill.
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Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
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National Twist Drill & Tool Co., Rochester, Mich.
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Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
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National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
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Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

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Dumore Co., 1300 17th St., Racine, Wis.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Hamilton Tool Co., 834 South 9th St., Hamilton, Ohio.
Henry & Wright Div., Emhart Mfg. Co., 760 Windsor St., Hartford 1, Conn.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.

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National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
Pratt & Whitney, West Hartford 1, Conn.

(Continued on page 368)

These parts help give Weston instruments their accuracy... they're checked on Kodak Contour Projectors

There is such a great variety of Weston instruments to measure all sorts of variables in all sorts of ranges that production on most individual items is small.

This creates a parts inspection problem. Precision requirements in many cases are so stringent that any measurable deviation from specifications is too big. Setting up toolroom instruments takes too long for the small volume of work being checked at any one time. Mechanical gages are even less economical at the low volume levels, and they just did not give the required accuracy on such jobs as checking the shoulder angles, concentricities, and specifications of the double-acting valve body shown above. (It goes in a recording thermometer and Weston makes it in many different sizes.)

Now Weston has converted to Kodak Contour Projectors. An inspector merely picks up the specification sheet covering a given part, gets the chart gage indicated there, puts it on the screen of the projector, and proceeds to sample according to specifications. Often, as with the valve body, gage blocks are used to step off the traverse of the projector work table. The inspector notes whether a shadow image coincides with a chart line after the table has carried it by the specified distance.

Possibly your inspection problems are volume and speed rather than the flexibility that Weston wants. In that case you will want to know about the Kodak Contour Projector, Model 3, which is designed for use with special staging fixtures instead of a moving work table. There is a field engineer in your area who can show you which model best fits your problem. To get in touch with him, just drop a note to *Eastman Kodak Company,* Industrial Optical Sales Division, Rochester 4, N. Y.

the KODAK CONTOUR PROJECTOR

Optical Gaging

A new sound movie shows how to simplify complex inspection problems. We'll tell you how to get it for a showing.

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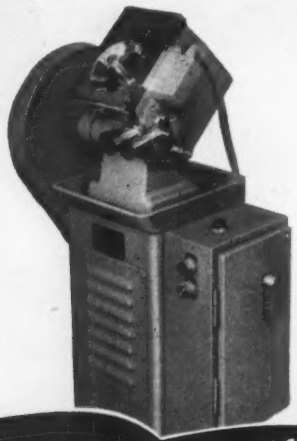

Model BME-19 BURR-MASTER for helical or spur gears or splines.

This *Burr-Master** gives you REAL VERSATILITY in gear and spline chamfering

Burrs and Chamfers Spur and Helical Gears and Splines

Note the complete chamfer produced by the Model BME-19 BURR-MASTER.

It is a simple matter to change over the Model BME-19 BURR-MASTER from burring and chamfering a spur gear to a helical or from a gear to a spline.

What is more, the Model BME-19 is amazingly fast, will completely burr and chamfer up to 5 teeth per second. Completely automatic, it does not require skilled operators. Machine never stops. Cycle indicator light tells operator when gear is finished.

There is a BURR-MASTER to fit practically every chamfering requirement regardless of the type of gear or spline.

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Moline Tool Co., 102 20th St., Moline, Ill.
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Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
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Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
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Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
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Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cleereman Mch. Tool Co., Green Bay, Wis.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
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(Continued on page 370)

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OLIVER ACE
Universal Tool and Cutter Grinders

BE WISE - OLIVERIZE

For maximum cutter-grinding efficiency in your toolroom, check these three important points:

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SPEED OF OPERATION. The Oliver Ace grinds the most difficult cutters—tackling with ease the toughest grinding jobs, including high-speed and Tungsten-Carbide work. Time lags are cut to the bone since the simplicity of design and operation make economy of motion and fast grinding certain with an Oliver.

PRECISION OPERATION. You get guaranteed accuracy with Oliver Cutter Grinders. They have been turning out precision-sharp cutters for years, gaining a solid reputation for doing the job for which they've been built.

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Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kingsbury Mch. Tool Corp., Keene, N. H.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
Millholland, W. K., Mchry. Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
Pratt & Whitney, West Hartford 1, Conn.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

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Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
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Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Kaukauna Machine Corp., Kaukauna, Wis.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.

DRILLING MACHINES, Rail

See Drilling Machines, Gang.

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Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
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Hamilton Tool Co., 834 South 9th St., Hamilton, Ohio.
Henry & Wright Div., Emhart Mfg. Co., 760 Windsor St., Hartford 1, Conn.
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Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
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Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
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Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.

(Continued on page 372)

These unusual jobs show the drawability of the Cincinnati Hydroform

CINCINNATI 12" HYDROFORM
Also built in 19", 23", 26" and 32" standard sizes. Write for Bulletin M-1759-1.

At left you see the result of Hydroforming. A deep cup shape has been drawn from a metal blank in one "squeeze." A simple draw ring and a male punch were the only tools required. A universal die member and *controlled* hydraulic pressure did the rest.

Here's how it works: The blank is placed between the punch and the universal die—an oil-filled cavity sealed by a flexible diaphragm. Hydraulic pressure is established in the cavity against the diaphragm to create a preliminary blankholding pressure. The punch is then moved upward. Displacement created in the cavity causes the pressure to increase. By accurately controlling the pressure, uniform forces are exerted on the blank from all directions and the blank is hydraulically formed to the shape of the punch.

Hydroforming makes possible more severe forming and deeper drawing in one operation than conventional methods allow. In addition to widening the range of the possible variety of shapes that can be drawn, the Hydroform's unique drawing action has been used to produce some unusual results. Several of these examples are described below, indicating the versatility of the process.

Why not investigate the advantages of Hydroforming for *your* production? Call in a Cincinnati Milling field engineer.

DRAWING A TAPERED BLANK

Problem: Keep part weight to a minimum, yet provide extra strength in certain areas. Solution: By proper directional orientation of a tapered blank, it is possible to concentrate the thicker sections of the blank to those areas where extra strength is required.

1 PART FROM 3 BLANKS OF 2 *DIFFERENT* MATERIALS—A HYDROFORMED *SANDWICH*

A part consisting of two or three *different* materials can be drawn simply by placing the blanks together. The part shown was produced by placing a blank of aluminum between two blanks of cold rolled steel.

CONTOURED OR ANGULAR FLANGES

Parts with contoured flanges or parts having the flange on an angle with the balance of the part represent difficult problems in normal manufacture. However, the Hydroform, with its advantage of accurately controlled blankholding pressure, can produce these parts with much less difficulty.

FORMING A REINFORCING BEAD

Utilizing the versatility of the Hydroform's flexible diaphragm made it possible to reinforce the part shown by drawing the shape and forming a bead on the top of the part without using additional tooling.

DRAWN, PIERCED AND TRIMMED BY HYDROFORMING

In some applications, the Hydroform can be tooled to pierce and trim materials during the forming operation. This part, of 0.020" aluminum, was produced as shown in one operation. Blanking intricate shapes from very thin materials is possible.

CASTING USED AS A PUNCH TO HYDROFORM THE PART THAT REPLACES IT

To determine the feasibility of converting from a cast part to a drawn part, one manufacturer had the answer at his fingertips by using a modified (uncored) part casting (top photo) as the punch from which the Hydroformed sample (bottom photo) was drawn.

Without the use of the Hydroform, this manufacturer would have had to underwrite the expense of designing and producing a matched die set before determining the most advantageous method of producing the part.

CINCINNATI Hydroform

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO, U. S. A.

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Moline Tool Co., 102 20th St., Moline, Ill.
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Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
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Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

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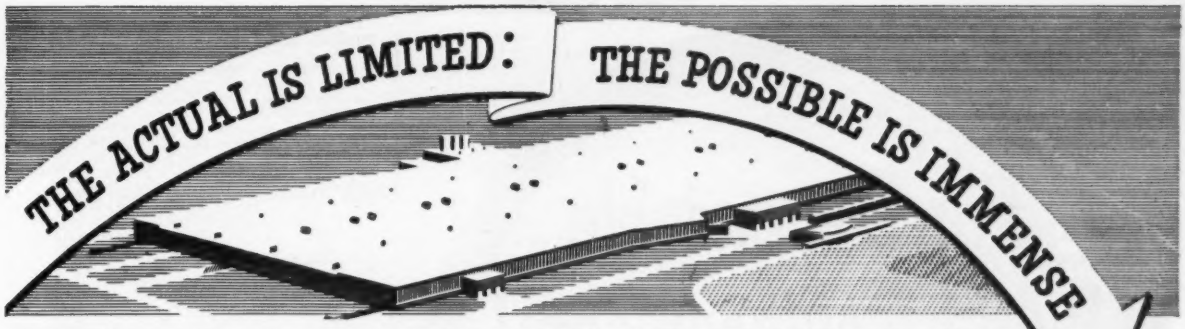
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.

(Continued on page 374)



NEW LINCOLN PLANT CREATED BY INCENTIVE-INSPIRED CO-ACTION IN DEVELOPING POSSIBILITIES IN PRODUCT

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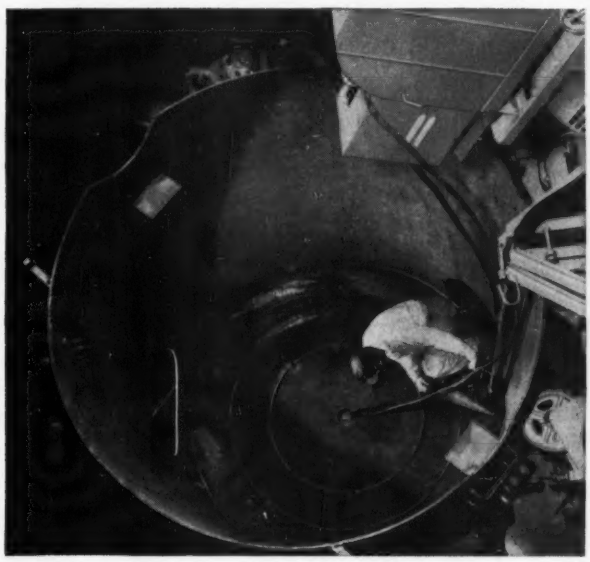

Fig. 3. High Current Density *on continuous electrode provides 100% penetration in one inside and one outside weld. "Hidden arc" welding in granular flux avoids arc rays and spatter . . . saves weld cleaning.*

USE of "hidden arc" welding with granular flux and positioners is cutting welding costs two-thirds in the fabrication of circuit breaker tanks at the Santa Clara plant of the Pacific Electric Manufacturing Corp. Exterior and interior welds are produced by positioning the welding gun of "Manual Lincolnweld" in a simple fixture. The work is then rotated beneath the welding gun with power rollers.

Currents of 375 to 400 amps concentrated on ¾" electrode produce full penetration at 12 to 15 inches per minute without need for plate preparation. Welds are self-cleaning to eliminate costly time in removing slag between passes as needed on conventional hand welding practice.

Undoubtedly results like these can be duplicated in your shop today. Consult a Lincoln welding engineer. Learn what new Lincoln developments in faster, easier welding can be applied to your operations to improve the quality of your work and cut production costs.

"MANUAL LINCOLNWELD" CUTS COSTS 67%

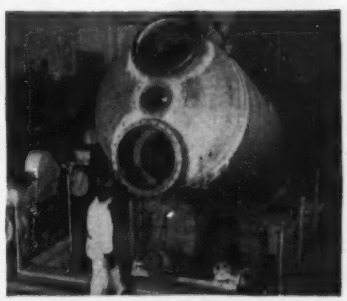

Fig. 1. Fabricates Tank *from ½" plate with "Manual Lincolnweld". Welding speed is 12 to 15 inches per minute at 400 amps.*

ELIMINATES JOINT PREPARATION

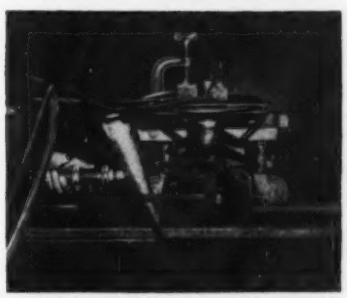

Fig. 2. Welding outside vertical seam *with "Manual Lincolnweld" gun mounted on simple rail fixture. Welding speeds are from 2 to 4 times faster than conventional hand welding.*

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GET THE FACTS—*Cost-saving benefits with Manual Lincolnweld are in Bulletin* 1303. *Write on your letterhead to Dept.* 1203.

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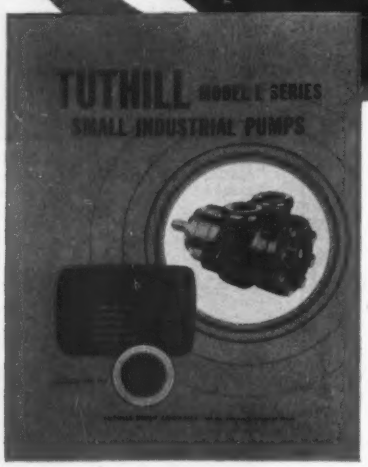

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(Continued on page 376)

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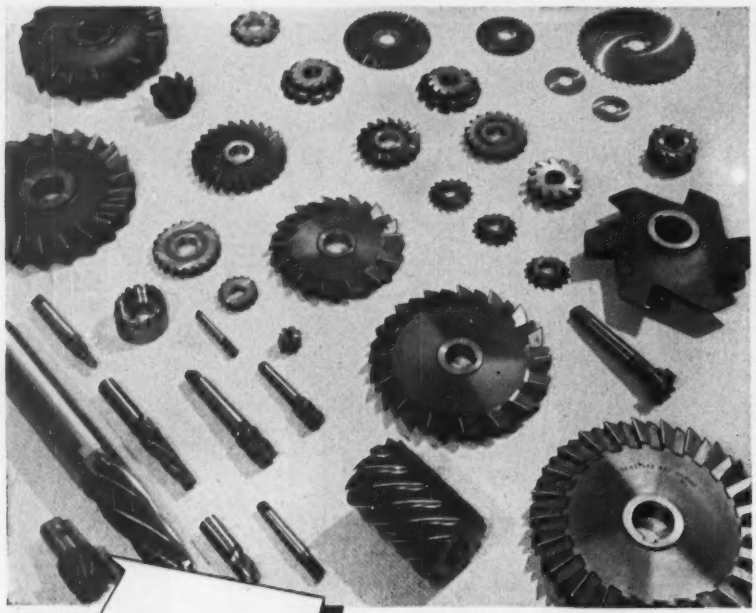

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(Continued on page 378)

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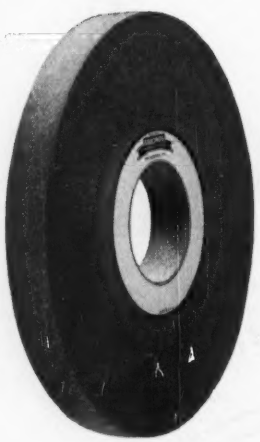

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Bethlehem Steel Co., Bethlehem, Pa.

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American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Bath, Cyril, Co., 6984 Machinery Ave., Cleveland 3, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Ferracute Machine Co., Bridgeton, N. J.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hufford Machine Works, Inc., 1700 E. Grand Ave., El Segundo, Calif. (Stretch-Wrap).
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
O'Neil-Irwin Mfg. Co., Lake City, Minn.
Peck, Stow & Wilcox Co., Southington, Conn.
Yoder Co., 5500 Walworth, Cleveland, Ohio.

FORMING AND STAMPING MACHINES

Chambersburg Engrg. Co., Chambersburg, Pa.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Henry & Wright Div., Emhart Mfg. Co., 760 Windsor St., Hartford 1, Conn.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Nilson, A. H., Mch. Co., 1506 Railroad Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.

FORMING TOOLS or Tool Blanks

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Brown & Sharpe Mfg. Co., Providence, R. I.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal, Inc., Latrobe, Pa.

(Continued on page 380)

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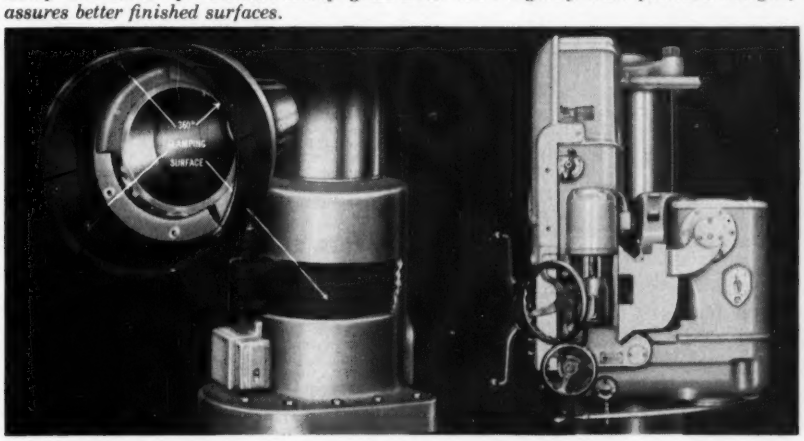
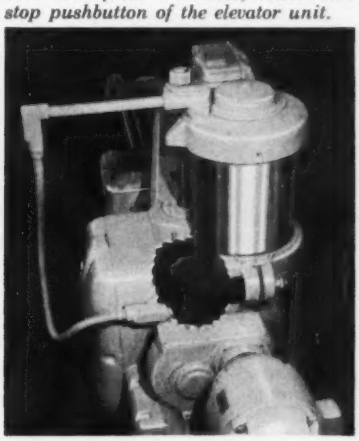


ARM CLAMP *and unclamp automatically controlled from the raise, lower and stop pushbutton of the elevator unit.*



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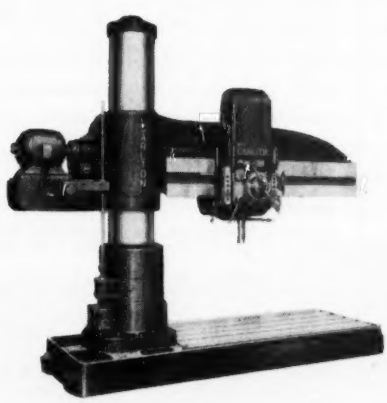

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Westinghouse Electric Corp., Pittsburgh 30, Pa.

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Standard Pressed Steel Co., Jenkintown, Pa.
Sturdi-Bilt Steel Products, Inc., 624 S. Michigan Ave., Chicago 5, Ill.

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DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.

GAGES, Air

DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
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Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Comparator

Ames, B. C., Co., Waltham 54, Mass.
Comtor Co., 47 Farwell St., Waltham 54, Mass.
DoAll Co, 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Depth

Ames, B. C., Co. (Dial), Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co, 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Homestrand, Inc., Larchmont, N. Y.
Millers Falls Co., Greenfield, Mass.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Dial

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Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Homestrand, Inc., Larchmont, N. Y.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Electric

DoAll Co, 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

GAGES, Height

Ames, B. C., Co., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Homestrand, Inc., Larchmont, N. Y.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.

(Continued on page 382)

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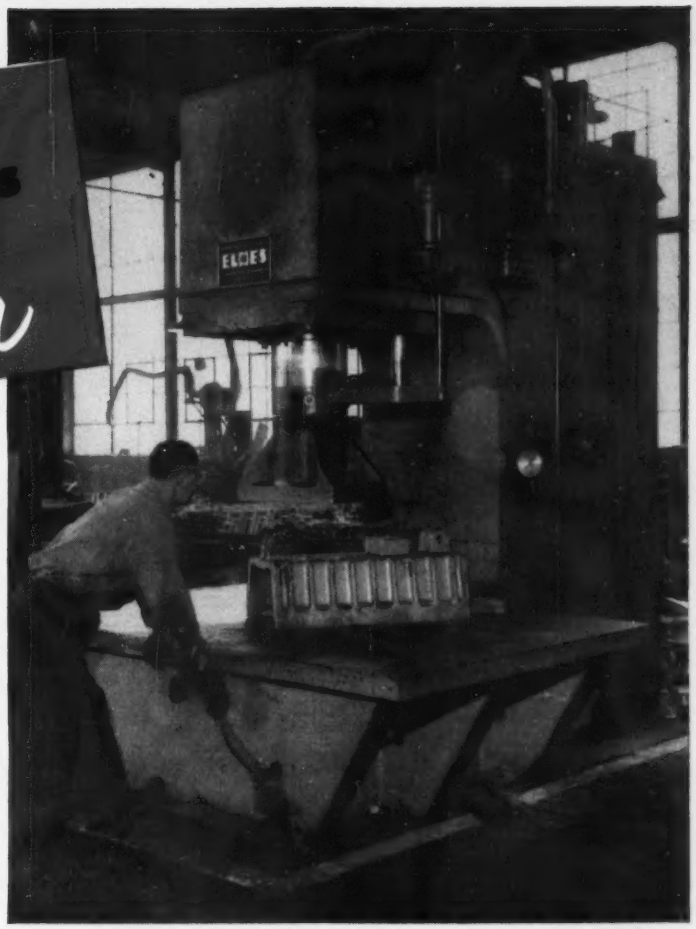

Elmes Open-Side Press in plant of Maynard Electric Steel Casting Company, Milwaukee, producers of electric furnace steel castings.

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Federal Products Corp., P. O. Box 1027, Providence, R. I.
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Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
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Taft-Peirce Mfg. Co., Woonsocket, R. I.
Turner Bros, Inc., 2625 Hilton Rd., Ferndale 20, Mich.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.
Vinco Corp., 9113 Schaefer Hwy., Detroit 28, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.
Woodworth, N. A., Co., 1300 E. Nine Mile Rd., Detroit 20, Mich.

GAGES, Surface

Ames, B. C., Co., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Columbus Die-Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
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Engis Equipment Co., 431 S. Dearborn St., Chicago 5, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Thread

Axelson Mfg. Co., P. O. Box 15335, Vernon Sta., Los Angeles 58, Calif.
Detroit Tap & Tool Co., Detroit, Mich.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Greenfield Tap & Die Corp., Greenfield, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Woodworth, N. A., Co., 1300 E. Nine Mile Rd., Detroit 20, Mich.

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Garlock Packing Co., Palmyra, N. Y.

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Braun Gear Co., 239 Richmond, Brooklyn 8, N. Y.
General Electric Co., Schenectady 5, N. Y.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

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Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
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Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Modern Industrial Engineering Co., 14228 Birwood, Detroit 4, Mich.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

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Eastman Kodak Co., Rochester, N. Y.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.
Michigan Tool Co., 7173 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass.
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(Continued on page 386)

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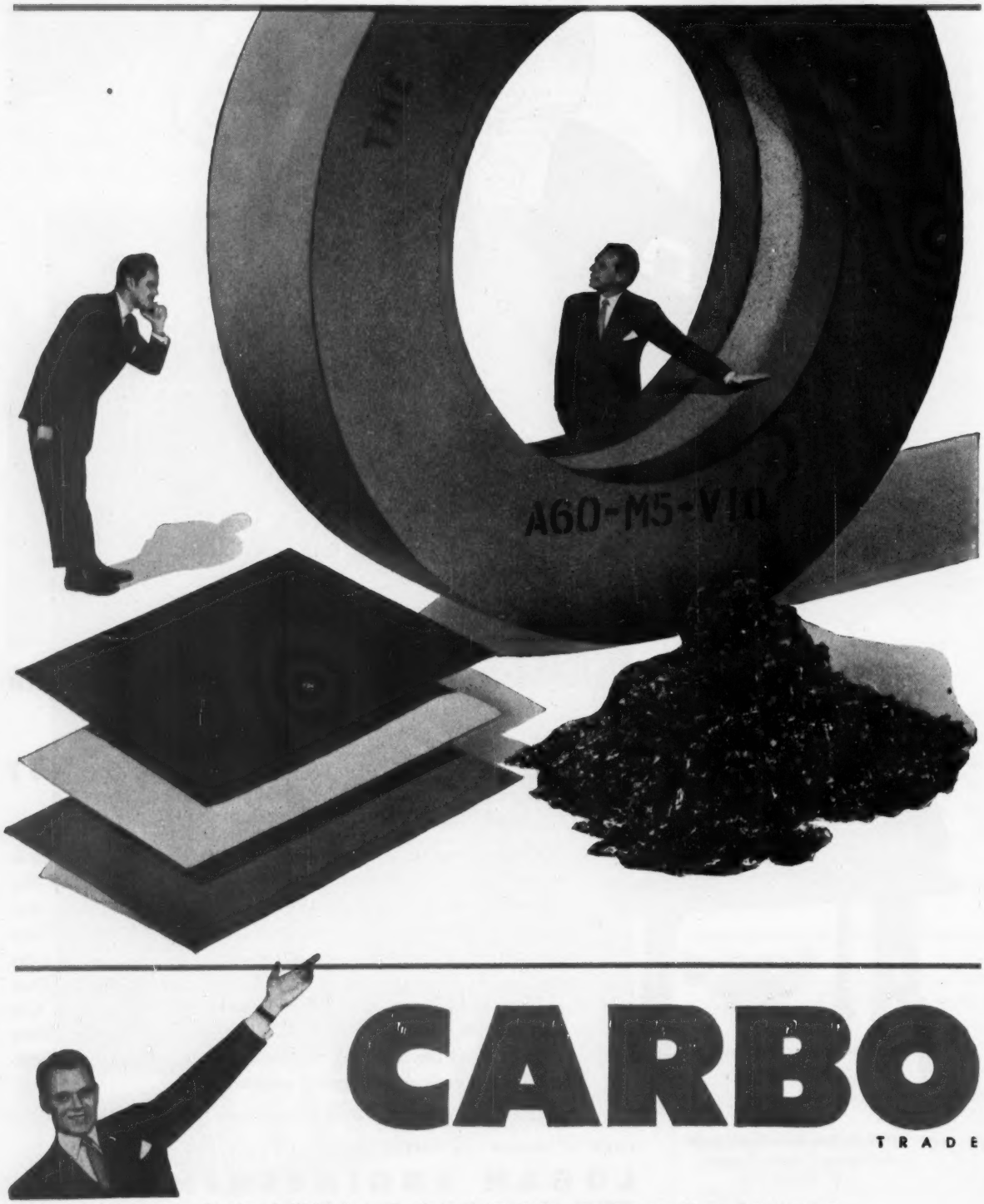

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New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
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Triplex Machine Tool Corp., 75 West St., New York 6, N. Y.

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Keivin Systems Corp., 135 Front St., New York 5, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.

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New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.

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National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
Pratt & Whitney, West Hartford 1, Conn.

GEAR HARDENING MACHINES

Gleason Works, 1000 University Ave., Rochester 3, N. Y.

GEAR LAPPING MACHINES

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National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.

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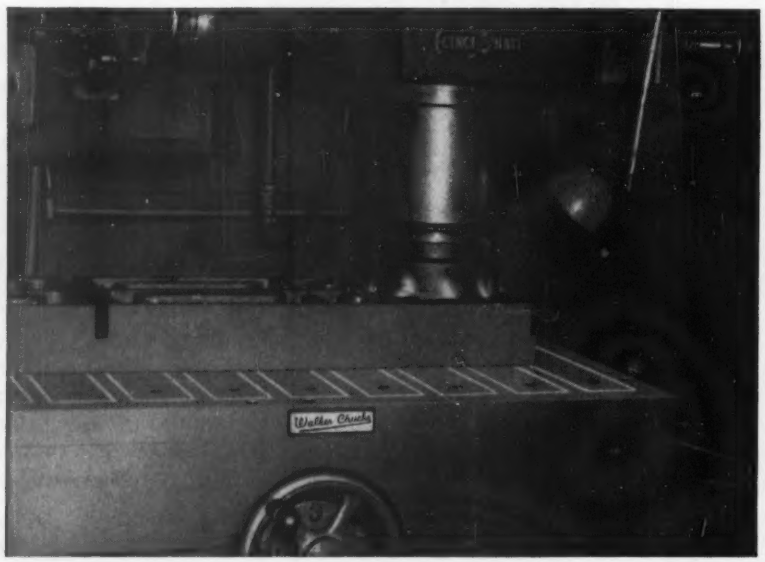
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Eastman Kodak Co., Rochester, N. Y.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

GEARS, Cut

American Stock Gear Div., Perfection Gear Co., Harvey, Ill.
Atlantic Gear Works, Inc., 200 Lafayette St., New York 12, N. Y.
Automotive Gear Works, Inc., Richmond, Ind.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Brad Foote Gear Works, 1309 S. Cicero Ave., Cicero 50, Ill.
Braun Gear Co., 239 Richmond, Brooklyn 8, N. Y.
Cincinnati Gear Co., Wooster Pike and Mariemont Ave., Cincinnati, Ohio.
Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland, Ohio.
Cone-Drive Gears Div., Michigan Tool Co., 7200 E. McNichols Rd., Detroit, Mich.
Diefendorf Gear Corp., 920 N. Beldon Ave., Syracuse, N. Y.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Gear Specialties, Inc., 2635 W. Medill Ave., Chicago 47, Ill.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Greaves Mch. Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Illinois Gear & Mch. Co., 2120 No. Natchez Ave., Chicago 35, Ill.

(Continued on page 388)

Walker Does It Again—

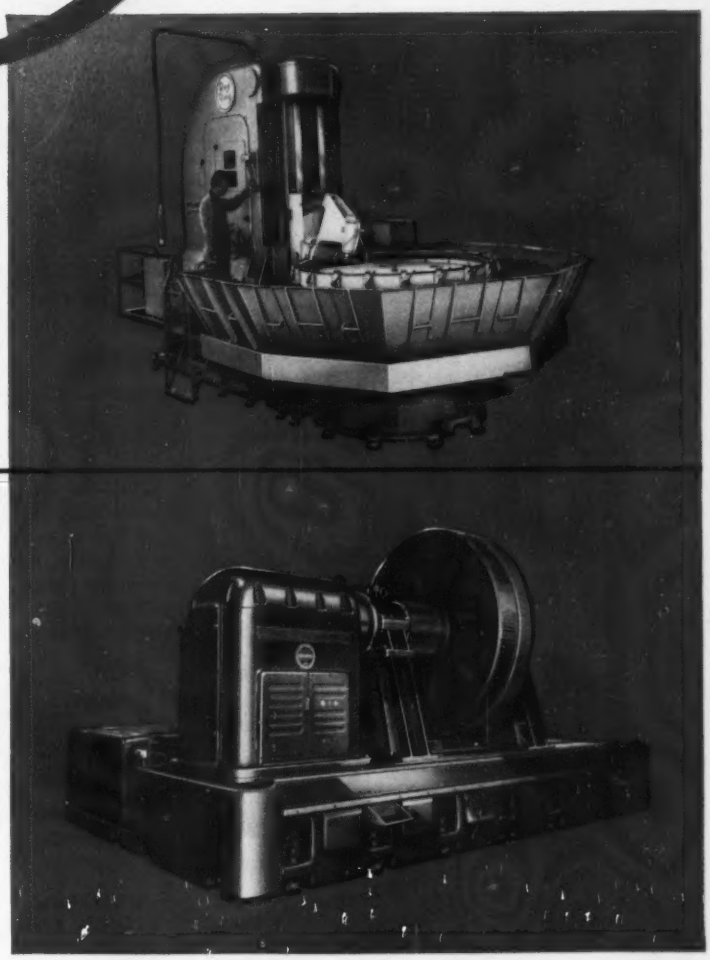


Milling machine operating a carbide cutter 660 f.p.m.; table feed 25 i.p.m. on rough steel castings. Walker Magnetic Chuck, securely holding workpiece, increases production equivalent to work of four planers. Take advantage of modern Walker methods for increasing production, reducing cost.

O. S. WALKER CO. Inc.
WORCESTER 6, MASSACHUSETTS
Original Designers and Builders of Magnetic Chucks

In Canada—Upton Bradeen & James, Ltd.

Large marine gear finishing practice moves ahead



ABOUT 11 years ago the first Red Ring machine for shaving large marine propulsion gears (up to 96" PD) was completed and put into commission. Its high precision and spectacular economy promptly initiated the now accepted practice of shaving for such gears.

Since then Red Ring machines have been built to shave larger marine gears. The United States, our fastest and largest ocean liner, launched last year, is driven by reduction gears shaved on Red Ring machines.

And now, nearing completion is a giant shaving machine to finish marine gears 15 feet in diameter to almost incredible tolerances on tooth form, pitch, lead and surface finish. With slight modifications, this unit will handle gears up to 200" PD. It will be displayed to this company's guests late in April.

SPUR AND HELICAL GEAR SPECIALISTS
ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORM

NATIONAL BROACH & MACHINE CO.
5600 ST. JEAN . . . . . DETROIT 13, MICHIGAN
WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

6282

Actually, standard stock sizes of Johnson Sleeve Bearings will meet at least 90% of your needs. And remember, you save special machine set-up costs, pattern charges, and other costs involved in made-to-order bearings. This is the most complete line of sleeve bearings on the industrial market. There are over 900 sizes of Johnson GP (general purpose) Cast Bronze Bearings, 200 sizes of Graphited Bearings, 340 distinct Johnson EM (electric motor) Bearings, and a wide selection of plain, flanged and self-aligning Ledaloyl Self-Lubricating Bearings. In addition, Johnson Universal Bronze Bars are available in over 400 sizes, cored and solid; also Johnson Babbitt. Your local Johnson Distributor can furnish your needs from stock.

JOHNSON BRONZE COMPANY
520 South Mill St., New Castle, Pa.

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Mass. Gear & Tool Co., 36 Nassau St., Woburn, Mass.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Perkins Mch. & Gear Co., Box 1611, Springfield 2, Mass.
Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa.
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.
Westinghouse Electric Corp., Pittsburgh 30, Pa.
Williamson Gear & Machine Co., 2606 Martha St., Philadelphia 25, Pa.

GEARS, Rawhide and Non-Metallic

American Stock Gear Div., Perfection Gear Co., Harvey Ill.
Atlantic Gear Works, Inc., 200 Lafayette St., New York 12, N. Y.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Braun Gear Co., 239 Richmond, Brooklyn 8, N. Y.
Cincinnati Gear Co., Wooster Pike and Mariemont Ave., Cincinnati, Ohio.
Diefendorf Gear Corp., 920 N. Beldon Ave., Syracuse, N. Y.
Gear Specialties, Inc., 2635 W. Medill Ave., Chicago 47, Ill.
Greaves Mch. Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.
Westinghouse Electric Corp., Pittsburgh 30, Pa.
Williamson Gear & Machine Co., 2606 Martha St., Philadelphia 25, Pa.

GENERATORS, Electric

General Electric Co., Schenectady 5, N. Y.
Lincoln Electric Co. (Arc), 22801 St. Clair Ave., Cleveland, Ohio.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

GOGGLES

American Optical Co., Southbridge, Mass.

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Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Greaves Mch. Tool Co., 2009 Eastern Ave, Cincinnati, Ohio.

GREASE

Cities Service Oil Co., 70 Pine St., New York, N. Y.
Gulf Oil Corp., Gulf Bldg., Pittsburgh 30, Pa.
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Lubriplate Div., Fiske Bros. Refining Co., 129 Lockwood St., Newark 5, N. J.
Sinclair Refining Co., 630 5th Ave., New York, N. Y.
Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.
Tide Water Associated Oil Co., 17 Battery Place, New York, N. Y.

GRINDERS, Carbide Tool

Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.

(Continued on page 390)

EXTRA POWER *for top performance*

In A Jet Plane, rockets supply the extra launching power needed for fast-climbing takeoff. In industry, Jacobs Plain Bearing Chucks supply the extra gripping power vital to top performance in light- and medium-duty drilling. This, plus rugged construction and precision accuracy, makes them the world's most widely used chucks.

The Jacobs Manufacturing Company, West Hartford 10, Connecticut.

IF IT'S A JACOBS IT HOLDS

Jacobs and your local distributor

are ready to deliver the chucks you need and the service you deserve.

. . . first in chucks

. . . first in service

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Consolidated Mch. Tool Corp., Rochester, N. Y.
Dumore Co., 1300 17th St., Racine, Wis.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.

GRINDERS, Oilstone, for Woodworking Tools

Mummert-Dixon Co., Hanover, Pa.

GRINDERS, Pneumatic

Bellows Co., 230 W. Market St., Akron, Ohio.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.
Ingersoll-Rand Co., Phillipsburg, N. J.
Keller Tool Co., Grand Haven, Conn.
Madison-Kipp Corp., Madison, Wis.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.

GRINDERS, Portable Electric and Toolpost

Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Dumore Co., 1300 17th St., Racine, Wis.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Millers Falls Co., Greenfield, Mass.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.

GRINDING FIXTURES

Geometric Tool Co. (Die Chaser), Westville Station, New Haven 15, Conn.
Madison Mfg. Co., Muskegon Heights, Mich.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GRINDING MACHINES, Abrasive Belt

Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Mattison Mch. Works, Rockford, Ill.
Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

GRINDING MACHINES, Bench

Besly-Welles Corp., Beloit, Wis.
Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Gorton, Geo., Mich. Co., 1110 W. 13th St., Racine, Wis.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.
Millers Falls Co., Greenfield, Mass.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.

GRINDING MACHINES, Broach

Colonial Broach Co. Detroit 13, Mich.
Lapointe Mch. Tool Co., 34 Tower St., Hudson, Mass.

GRINDING MACHINES, Camshaft

Landis Tool Co., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.

GRINDING MACHINES, Carbide Tool

Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Triplex Machine Tool Corp., 75 West St., New York 6, N. Y.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

GRINDING MACHINES, Centerless

Cincinnati Grinders, Inc., Cincinnati, Ohio.
Diversified Metal Products Co., 5125 Alcoa Ave., Los Angeles 58, Calif.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Landis Tool Co., Inc., Waynesboro, Pa.
Triplex Machine Tool Corp., 75 West St., New York 6, N. Y.

GRINDING MACHINES, Chucking

Bryant Chucking Grinder Co., 257 Clinton St., Springfield, Vt.
Landis Tool Co., Inc., Waynesboro, Pa.

GRINDING MACHINES, Crankshaft

Landis Tool Co., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.

(Continued on page 392)

ADJUSTAFIX
A Name On Which To Rely
THE NEW
DOUBLE ECCENTRIC
ADJUSTABLE
DRILL HEAD
Practically universal adjustment. 2 to 8 spindle, standard. Also specially designed heads.
Built for continuous use with full anti-friction bearing construction for high capacity thrust loads...precision-bored outboard spindle support plate.
UNITED STATES DRILL HEAD CO., CINCINNATI 4, OHIO
We manufacture all types of multiple spindle, fixed center and lead screw tapping heads
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17 BATTERY PLACE · NEW YORK 4, N.Y.

GRINDING MACHINES, Cylindrical

Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Grinders, Inc., Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Dumore Co., 1300 17th St., Racine, Wis.
Frauenthal Div., Kaydon Engineering Corp., Muskegon, Mich.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Kelvin Systems Corp., 135 Front St., New York 5, N. Y.
Landis Tool Co., Inc., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

GRINDING MACHINES, Die Chaser

Eastern Mch. Screw Corp., New Haven, Conn.
Landis Machine Co., Waynesboro, Pa.

GRINDING MACHINES, Disc

Besly-Welles Corp., Beloit, Wis
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Mattison Machine Works, Rockford, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.

GRINDING MACHINES, Drill

Blake, Edward, Co., 442 Cherry St., West Newton 65, Mass.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Gallmeyer & Livingston Co., 336 Straight Ave., S. W. Grand Rapids 4, Mich.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Union Twist Drill Co., Athol, Mass.

You get a wider work range than with any other machine this size. You can machine at *any* angle—vertical, horizontal or both. You can mill, drill or bore at any angle. Hence resetting isn't necessary. Just change the machine—changing is quick. (For vertical and regular horizontal milling, use the 10-RH.) Jobs are done faster and better . . . at less cost. • It's Universal • Rugged • Easy to Operate.

A high precision tool.

Write for details and specifications.

Bulletin 10.

FRAY "ALL-ANGLE" HEAD TYPE 4

For deep, heavy cuts. Permits working to extra close limits. Any angle up to compound 2-way. Request Bulletin 4.

All-Angle

FRAY MACHINE TOOL CO.

GRINDING MACHINES, Face

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Besly-Welles Corp., Beloit, Wis.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Mattison Machine Works, Rockford, Ill.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.

GRINDING MACHINES, Flexible Shaft

See Flexible Shaft Equipment.

GRINDING MACHINES, Gap

Cincinnati Grinders, Inc., Cincinnati, Ohio.
Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES, Gear Tooth

See Gear Grinding Machines.

GRINDING MACHINES, For Sharpening Cutters, Reamers, Hobs, Etc.

Barber-Colman Co., Rock and Montague, Rockford, Ill.
British Industries Corp., 164 Duane St., New York, N. Y.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gallmeyer & Livingston Co., 336 Straight Ave., S. W. Grand Rapids 4, Mich.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Landis Tool Co., Waynesboro, Pa.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Thompson Grinder Co., 1500 W. Main St., Springfield, Ohio.
Union Twist Drill Co., Athol, Mass.

GRINDING MACHINES, For Sharpening Turning and Planing Tools

Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Walker, O. S., Co., Inc., Worcester, Mass.
Waltham Machine Works, Newton St., Waltham, Mass.

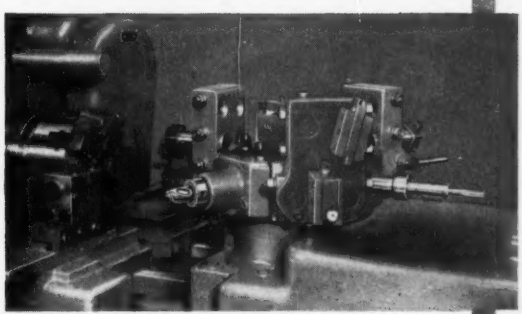
GRINDING MACHINES, Internal

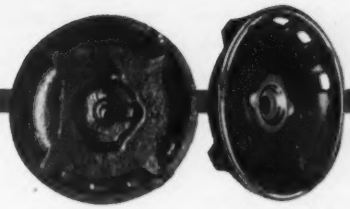
Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.
Bryant Chucking Grinder Co., 257 Clinton St., Springfield, Vt.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Dumore Co., 1300 17th St., Racine, Wis.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Frauenthal Div., Kaydon Engineering Corp., Muskegon, Mich.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.

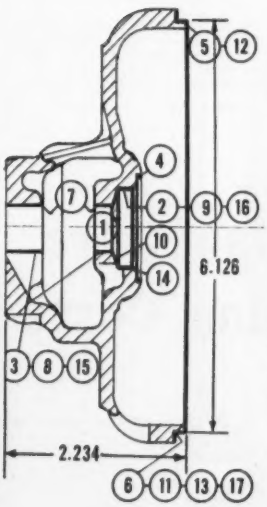
(Continued on page 394)

NOT CLAIMS...
BUT
ACTUAL FACTS!

17 Operations in 1.85 Minutes







FIRST TURRET FACE
1 Spot Drill Hole
2 Rough bore 1.125" counterbore

SECOND TURRET FACE
3 Core drill hole through
4 Machine two pads at front of hole
5 Rough face end at rim
6 Rough face and form turn 6.126" diameter

THIRD TURRET FACE
7 Break corners at core in center of hole (Slide Tool)

FOURTH TURRET FACE
8 Finish bore hole
9 Finish bore 1.125" diameter
10 Counterbore and form bevel at bottom
11 Finish turn 6.126" diameter
12 Finish face end
13 Finish face shoulder
14 Chamfer

FIFTH TURRET FACE
15 Ream hole .6245" diameter

SIXTH TURRET FACE
16 Ream counterbore 1.125" diameter
17 Size turn 6.126" diameter

SURFACES MACHINED ARE INDICATED BY HEAVY LINES

with a 3U SPEED-FLEX Automatic Turret Lathe PLUS P&J TOOLING

Machining this cast iron motor bracket in just 1.85 minutes isn't a special record run for a 3U Speed-Flex, but another example of the fast, accurate work you can expect day in and day out from a P & J Automatic *plus* P & J Tooling on almost any job requiring a high output of small, precision parts.

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Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Wicaco Machine Corp., Stenton Ave. and Louden St., Philadelphia, Pa.

GRINDING MACHINES, Jig

Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Moore Special Tool Co., Inc., 724 Union Ave., Bridgeport, Conn.
Pratt & Whitney, West Hartford 1, Conn.

GRINDING MACHINES, Knife and Shear Blade

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Mattison Machine Works, Rockford, Ill.

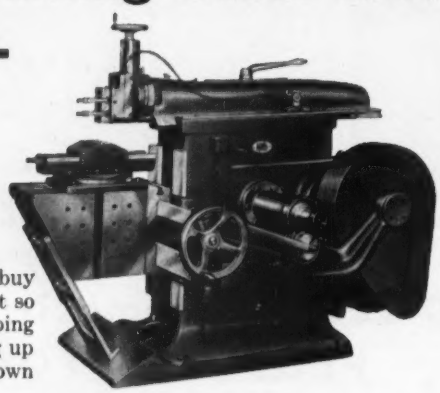
GRINDING MACHINES, Piston Ring

Besly-Welles Corp., Beloit, Wis.
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Mattison Machine Works, Rockford, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnat i4, Ohio.

GRINDING MACHINES, Profile

Cleveland Grinding Machine Co., 1643 Eddy Rd., Cleveland 12, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

93 Now ~~72~~ Busy Plants Are Cutting Machining Costs with KLOPP High-Production Shapers



IMMEDIATE DELIVERY FROM STOCK

KLOPP shapers cost so little to buy . . . so little to run, yet turn out so much production, they're stepping into plant-after-plant—stepping up toolroom output and cutting down costs.

Bulky, awkward-to-handle work pieces are easily accessible and simple to set up in the KLOPP—because the *head travels to the work*. It's built for high-speed, too, by Europe's largest manufacturer of shapers—at KLOPP'S fully integrated plant—where the complete machines, including all their components from castings to electric motors, are produced.

Write for names of prominent KLOPP users near you. And ask us to quote on your requirements for one or a battery of these fast-producing cost cutters.

Engineered servicing from Orban Service Centers in Cleveland, Detroit, Newark. Stock parts from Cleveland.

SPECIFICATIONS

MECHANICAL SHAPERS—stroke lengths 16¾", 20⅔", 26⅝". Six rates of speeds with normal motor, 12 with two-speed motor. Accelerated return motion. Single lever control within easy reach of operator. Swivel work table can be set to either side at any angle up to 90°.

FULLY HYDRAULIC MODELS—stroke lengths 26", 33½", 39½". Infinitely variable ram speeds with quick return and minimum power consumption. Central operator control panel. Tool holder with graduated scale swivels 45° to either side. Self-acting downfeed of tool slide. Automatic tool lifting device available.

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1939 Santa Fe Ave., Los Angeles

GRINDING MACHINES, Radial, Ball Race, Etc.

Besly-Welles Corp., Beloit, Wis.
Frauenthal Div., Kaydon Engineering Corp., Muskegon, Mich.
Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES, Radius, Link

Consolidated Mch. Tool Corp., Rochester, N. Y.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

GRINDING MACHINES, Ring Wheel

Besly-Welles Corp., Beloit, Wis.
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Mattison Machine Works, Rockford, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.

GRINDING MACHINES, Roll

Farrel-Birmingham Co., 25 Main St., Ansonia, Conn.
Landis Tool Co., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.

GRINDING MACHINES, Spline Shaft

Kelvin Systems Corp., 135 Front St., New York 5, N. Y.

GRINDING MACHINES, Surface

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.
Besly-Welles Corp., Beloit, Wis.
Blanchard Machine Co., 64 State St., Cambridge, Mass.
British Industries Corp., International Machinery Div., 164 Duane St., New York, N. Y.
Brown & Sharpe Mfg. Co., Providence, R. I.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Frauenthal Div., Kaydon Engineering Corp., Muskegon, Mich.
Gallmeyer & Livingston Co., 336 Straight Ave., S. W., Grand Rapids 4, Mich.
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Mattison Machine Works, Rockford, Ill.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Reid Bros. Co., Inc., Beverly, Mass.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Thompson Grinder Co., 1500 W. Main St., Springfield, Ohio
Walker, O. S., Co., Inc., Worcester, Mass.

GRINDING MACHINES, Tap

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.

GRINDING MACHINES, Thread

Dumore Co., 1300 17th St., Racine, Wis.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Landis Machine Co. (Centerless), Waynesboro, Pa.
Landis Tool Co. (Centerless), Waynesboro, Pa.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

GRINDING MACHINES, Universal

Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Grinders, Inc., Cincinnati, Ohio.
Frauenthal Div., Kaydon Engineering Corp., Muskegon, Mich.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.

(Continued on page 396)

INDUCTION HARDENING WRENCHES AT UTICA DROP FORGE CORP.

Wrench Life Increased Ten Times With G-E Induction Heaters

"By induction-hardening working surfaces with G-E induction heaters, we are now making wrenches and pliers that last ten times longer," says Maynard Gray, Foreman, Heat Treating Dept., Tool Division, Utica Drop Forge & Tool Corp., Utica, N. Y.

Utica has found they can heat treat *only* the areas to be extra hardened —leaving the internal structure of the tool unchanged and preserving the desirable toughness necessary to withstand stress and shock.

Lower labor costs and increased production are other benefits of G-E induction heating. At Utica one operator induction hardens 350 wrenches per hour or almost six per minute! In each case the tool is put on a special jig, heated, then immediately cooled by a jet of air.

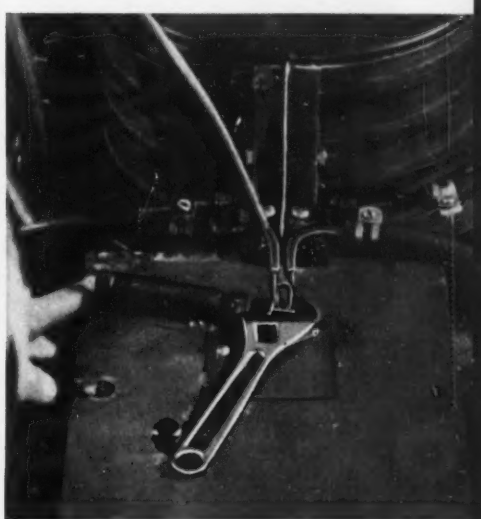
Hardening is only one of many uses for G-E induction heaters. Other equally important applications are annealing, soft-soldering, brazing, and other jobs where it is necessary to localize the heating of parts. You'll find G.E.'s complete line of induction heaters can help you to accomplish your heating in the fastest, cleanest, and most economical way.

For more information on how induction heating can save you time and money contact your Apparatus Sales representative. And write now for bulletins on G-E induction heaters to General Electric Co., Sect. 720-104, Schenectady 5, N. Y.

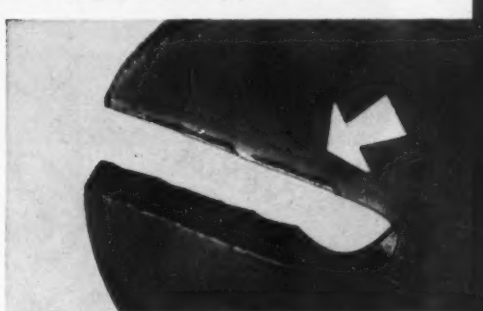
You can put your confidence in—

GENERAL ELECTRIC

DARK AREAS SHOW where wrench-jaw surfaces are extra-hardened selectively by induction heat to resist burring and nicking.



SELECTIVE HEATING with G-E heaters is a fast process. With this special fixture, heating and cooling cycle takes only 10 seconds.



WITHOUT INDUCTION HARDENING wrench had tendency to wear or burr-over on the jaw surfaces after a given number of applications.

WITH INDUCTION HARDENING this same type wrench showed no burring or other wear when given 17 times the number of applications.

Kelvin Systems Corp., 135 Front St., New York 5, N. Y.
Landis Tool Co., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.

GRINDING MACHINES, Worm

Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Pratt & Whitney, West Hartford 1, Conn.

GRINDING WHEELS

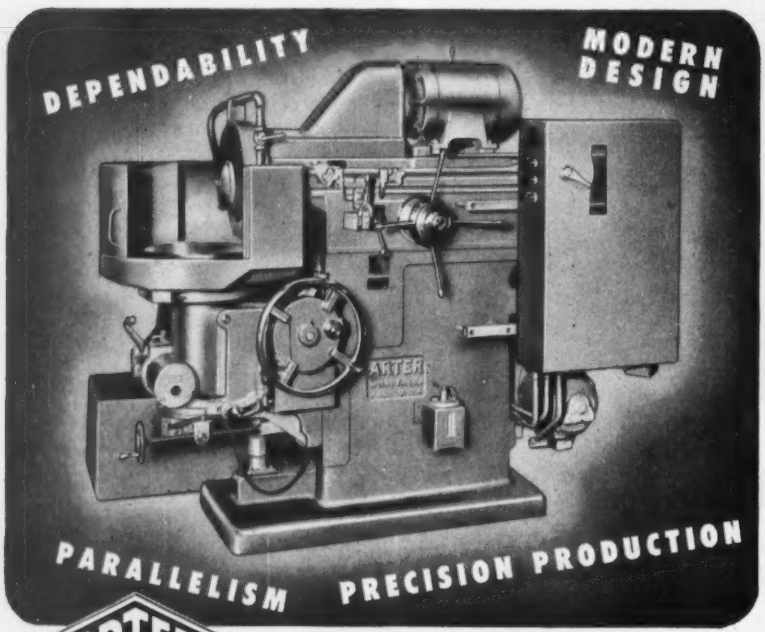
Bakelite Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
Bay State Abrasive Products Co., Westboro, Mass.
Besly-Welles Corp., Beloit, Wis.
Blanchard Machine Co., 64 State St., Cambridge, Mass.
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Cincinnati Milling Machine Co., Grinding Wheels Div., Cincinnati, Ohio.
Gardner Machine Co. (Surface Grinder), 414 E. Gardner St., Beloit, Wis.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Precision Diamond Tool Co., 102 South Grove Ave., Elgin, Ill. (Diamond).
Simonds Abrasive Co., Tacony and Fraley Sts., Bridesburg, Philadelphia, Pa.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.

GROOVING TOOLS, Internal

Waldes Kohinoor, Inc., 4716 Austel Place, Long Island City 1, N. Y.

HAMMERS, Drop

Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Morgan Engrg. Co., Alliance, Ohio.



ARTER

Rotary SURFACE GRINDERS

Model D • 12" and 16"

Arter has been building Rotary Surface Grinders for more than thirty years. The Model D machines are an intermediate series, 12" and 16" in diametrical capacity. They are modern in design, dependable and built to give years of satisfactory service to all users of this type of precision grinder.

Write today for complete details and specifications.

Arter GRINDING MACHINE CO.
WORCESTER 5, MASSACHUSETTS

HAMMERS, Forging Air

Chambersburg Engrg. Co., Chambersburg, Pa.
Lobdell United Co., 2000 "G" St., Wilmington 99, Del.

HAMMERS, Pneumatic

Chambersburg Engrg. Co., Chambersburg, Pa.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.
Ingersoll-Rand Co., Phillipsburg, N. J.
Keller Tool Co., Grand Haven, Mich.

HAMMERS, Portable Electric

Black & Decker Mfg. Co., E. Penna Ave., Towson, Md.
Millers Falls Co., Greenfield, Mass.

HAMMERS, Power

Chambersburg Engrg. Co., Chambersburg, Pa.
Lobdell United Co., 2000 "G" St., Wilmington 99, Del.

HAMMERS, Shaft

S K F Industries, Inc., P. O. Box 6731, North Philadelphia, Pa.
Standard Pressed Steel Co., Jenkintown, Pa.

HAMMERS, Soft

Chambersburg Engrg. Co., Chambersburg, Pa.

HAMMERS, Steam

Chambersburg Engrg. Co., Chambersburg, Pa.

HARDENING EQUIPMENT

Ohio Crankshaft Co., 3800 Harvard Ave., Cleveland, Ohio.

HARDENING MACHINES, Flame

Cincinnati Milling Machine Co., Cincinnati, Ohio.

HARDNESS TESTING INSTRUMENTS

Ames Precision Mch. Wks., Waltham, Mass.
Shore Instrument & Mfg. Co., Van Wyck Ave. and Carll St., Jamaica, N. Y.
Wilson Mechanical Instrument Co., Inc., 230-D Park Ave., New York, N. Y.

HEADING MACHINES

National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.

HEAT-TREATING EQUIPMENT

Ipsen Industries, Inc., 536 N. Madison, Rockford, Ill.

HOBBING MACHINES

See Gear Cutting Machines, Spur and Helical Gears (Hobbing), and Gear Cutting Machines, Worm and Worm Wheels.

HOBS

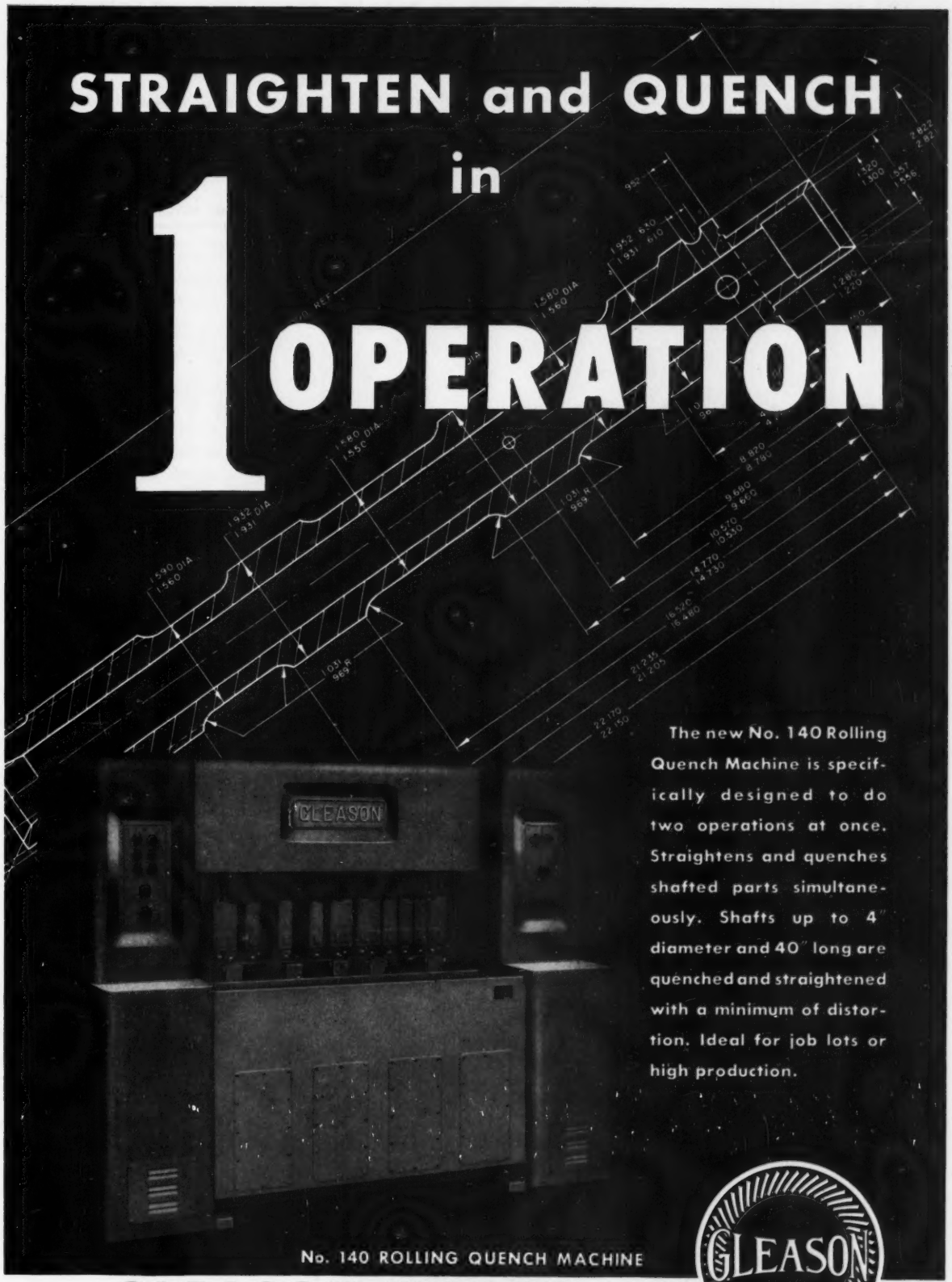
Barber-Colman Co., Rock and Montague, Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tool Co., Rochester, Mich.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Union Twist Drill Co., Athol, Mass.

HOIST HOOKS

Bethlehem Steel Co., Bethlehem, Pa.

(Continued on page 398)

STRAIGHTEN and QUENCH in 1 OPERATION



The new No. 140 Rolling Quench Machine is specifically designed to do two operations at once. Straightens and quenches shafted parts simultaneously. Shafts up to 4" diameter and 40" long are quenched and straightened with a minimum of distortion. Ideal for job lots or high production.

No. 140 ROLLING QUENCH MACHINE

GLEASON WORKS

BUILDERS OF BEVEL GEAR MACHINERY FOR OVER 85 YEARS

1000 UNIVERSITY AVE. · ROCHESTER 3, NEW YORK

GLEASON

HOISTING AND CONVEYING EQUIPMENT
Cleveland Crane & Engrg. Co., Wickliffe, Ohio.

HOISTS, Air
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.
Keller Tool Co., Grand Haven, Mich.

HOISTS, Chain, Etc.
Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

HOISTS, Electric
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.

HONES
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Moline Tool Co., 102 20th St., Moline, Ill.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Sunnen Products Co. (Internal & External), 7900 Manchester Ave., St. Louis 17, Mo.

HONING MACHINES, Internal (Cylinder)
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Micromatic Hone Corp., 8100 Schoolcraft, Detroit 4, Mich.
Moline Tool Co., 102 20th St., Moline, Ill.
Sunnen Products Co., 7900 Manchester Ave., St. Louis 17, Mo.

HONING MACHINES, External
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Micromatic Hone Corp., 8100 Schoolcraft, Detroit 4, Mich.

HONING TOOLS AND FIXTURES
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Micromatic Hone Corp., 8100 Schoolcraft, Detroit 4, Mich.
Sunnen Products Co., 7900 Manchester Ave., St. Louis 17, Mo.

HOSE, Leather, Rubber, Metallic, Etc.
American Metal Hose Br. American Brass Co., 25 Broadway, New York, N. Y.
Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.
Titeflex, Inc., 500 Frelinghuysen Ave., Newark 5, N. J.

HYDRAULIC MACHINERY, Tools and Equipment
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Barnes, John S., Corp., Rockford, Ill.
Bethlehem Steel Corp., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.
Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.
Farquhar, A. B., Div. Oliver Corp., 21 Duke St., York, Pa.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.
Walker Hydraulic Duplicator Co., Box 200, Standish, Mich.
Watson-Stillman Co., Div., H. K. Porter Co., Inc., Roselle, N. J.
Wilson, K. R., 215 Main St., Buffalo, N. Y.
Wood, R. D., Co., Public Ledger Bldg., Philadelphia 5, Pa.

HYDRAULIC POWER UNITS OR TOOL HEADS
Bellows Co., 230 W. Market St., Akron, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, John S., Corp., Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.

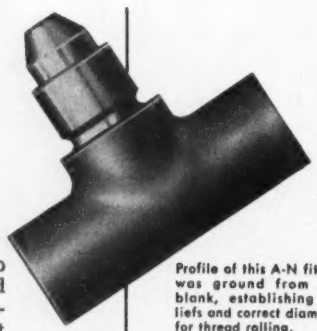
INDEXING AND SPACING EQUIPMENT
Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Bellows Co., 230 W. Market St., Akron, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Engis Equipment Co., 431 S. Dearborn St., Chicago 5, Ill.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Kempsmith Machine Co., 1819 S. 71st St., Milwaukee 14, Wis.
Nichols-Morris Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

INDICATORS, Dial
Ames, B. C., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.

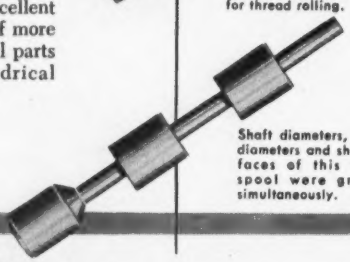
(Continued on page 402)

Who'd think of CENTERLESS GRINDING parts like these?

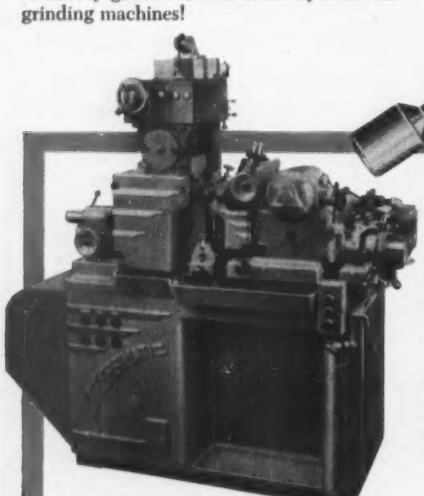
DIVERSIMATIC is opening new doors to the production minded! Parts long unsuited to centerless grinding are now being handled readily, with fast production, excellent finish and close tolerances. Savings of more than 500% have been made on small parts formerly ground on external cylindrical grinding machines!



Profile of this A-N fitting was ground from the blank, establishing reliefs and correct diameter for thread rolling.



Shaft diameters, major diameters and shoulder faces of this valve spool were ground simultaneously.

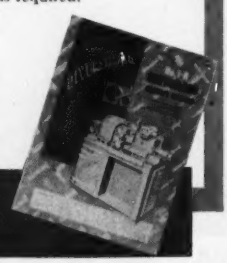


Choice of Two Wheel Profiling Methods

Diversimatic may be obtained with DIAMOND DRESSERS for profiling and dressing the wheel or with the exclusive CRUSH FORMING ATTACHMENT which establishes and maintains wheel profile almost instantaneously.

HANDY AS A TAPER ATTACHMENT ON A LATHE! The crush forming attachment does not interfere with conventional centerless grinding but *is ready to use* when form grinding is required!

If you have a production problem involving form work, finish and tolerance don't rule out centerless grinding—CALL IN DIVERSIMATIC*—the grinder with the spindle that needs no warm-up!*



DIVERSIFIED METAL PRODUCTS CO.
2838 Leonis Boulevard • Los Angeles 58, California

Corrosion-resistance and strength

PLUS

MACHINABILITY

Superheated steam scorches across them . . . centifugal force tries to tear them apart . . . and an out-of-balance turbine would be disastrous. That's the punishment these steam turbine blades have to take. And, that's the reason why they're forged and machined from Republic ENDURO Stainless Steel Bars.

ENDURO stubbornly resists corrosion . . . and rust. It maintains its great strength at high temperatures. It can be accurately and economically forged and machined.

Three different forms of ENDURO bars are used in turbine blade manufacture: hot rolled bars for forging larger blade sizes; cold finished bars for machining smaller sizes; and a cold finished special section, one of many such sections produced by Republic's Union Drawn Steel Division.

Have you an application in which you need increased strength? . . . increased resistance to corrosion? . . . plus economical machining? Then, investigate Republic ENDURO Stainless Steel . . . in hot rolled or cold finished bars, and in wire. Ask Republic for metallurgical assistance in applying them, too. Just write:

REPUBLIC STEEL CORPORATION

Alloy Steel Division • Massillon, Ohio

GENERAL OFFICES • CLEVELAND 1, OHIO

Export Department: Chrysler Building, New York 17, N. Y.

Republic

REPUBLIC STEEL

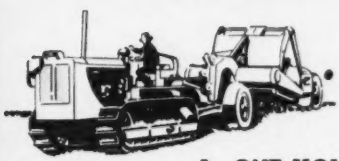
ENDURO STAINLESS STEEL

Other Republic Products include Carbon and Alloy Steels—Pipe, Sheets, Strip, Plates, Bars, Wire, Pig Iron, Bolts and Nuts, Tubing

GEAR CUTTING
GEAR FINISHING
Complete Equipment
For Gear Production
GEAR LAPPING
GEAR CHECKING
Model 18105 Shear-Speed Cuts
Costs at Caterpillar

ONE SHEAR-SPEED* CUTS CATERPILLAR CLUSTERS

REG U S PAT OFF



. . . in 1/8 the time!

In ONE HOUR, one SHEAR-SPEED shaper cutter cuts as many teeth on these final drive gear and pinion clusters as were cut by previous methods in EIGHT HOURS at Caterpillar Tractor Co. Less floor space is required, and the Shear-Speed has no trouble keeping up with production requirements. Both gears are cut on the same Shear-Speed.

The blank weighs 70 pounds—20 pounds of metal is removed in cutting the teeth. Cutting time for the 10.372" diameter, 27 tooth gear is 7.5 pieces floor to floor per hour; the 12 teeth on the 6.097" diameter pinion are cut at the rate of 6.5 gears per hour.

Twenty-one complete gears were produced in 8 hours by previous standard hobbing and shaping methods on 6 machines. Diametral pitches are 2.750 on the gear and 2.413 on the pinion. Face widths are 2 1/16" and 4 3/16".

*Registered Trademark

GEAR PRODUCTION HEADQUARTERS

MICHIGAN TOOL CO. DETROIT U.S.A.

COMPLETE from blank to finished gear EQUIPMENT

7171 E. McNICHOLS RD. • DETROIT 12, MICHIGAN, U. S. A.

Federal Products Corp., P. O. Box 1027, Providence, R. I.
Homestrand, Inc., Larchmont, N. Y.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.

INDICATORS, Speed

Bristol Co., Platts Mills, Waterbury, Conn.
Brown & Sharpe Mfg. Co., Providence, R. I.
Starrett, The L. S., Co., Athol, Mass.
Veeder-Root, Inc., 20 Sargent St., Hartford, Conn.

INDICATORS, Test

Ames, B. C., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.

INDUCTION HEATING EQUIPMENT

General Electric Co., Schenectady, N. Y.
Ohio Crankshaft Co., 3800 Harvard Ave., Cleveland, Ohio.

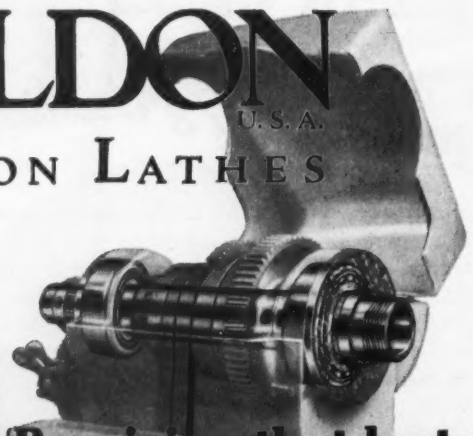
INTENSIFIERS, Hydraulic

Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Farquhar, A. B., Div. Oliver Corp., 21 Duke St., York, Pa.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Morgan Engrg. Co., Alliance, Ohio.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wood, R. D., Co., Public Ledger Bldg., Philadelphia 5, Pa.

JACKS, Planer

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.

SHELDON
CHICAGO U. S. A.
PRECISION LATHES



SHELDON
"Stamina" Features:

- Rigid, Heavily cross-strutted 1-piece Beds—2 V-ways, 2 Flat ways
- Full Double-Walled Aprons—all gear shafts supported on both ends
- Heavy Carriage with wide bearing on bed.
- Twin V-Belts to Spindle for extra power.

Precision that lasts
. . . "ZERO PRECISION" TIMKEN TAPER ROLLER BEARINGS

No lathe can be more accurate than its spindle bearings. Hence before buying any lathe one should check the *exact* type and tolerances of bearings used.

The No. TS-56B (and several other) SHELDON Precision Lathes have Timken "Zero Precision" Taper Roller Bearings, held to tolerances of .00015". Not only are these the most accurate bearings used in any lathe, they are the sturdiest type . . . hold their accuracy thru long hard use . . . hold it even under abuse. With the other stamina features built into SHELDON Precision Lathes, they assure continued accuracy, without costly maintenance, thru years of hard service.

Write for Catalog

SHELDON MACHINE CO., INC.
4246 N. Knox Ave., Chicago 41, Illinois

JIG BORER

See Boring Machines, Jig.

JIGS AND FIXTURES

Allied Products Corp., 12677 Burt Rd., Detroit 23, Mich.
Bath, Cyril, Co., 6984 Machniery Ave., Cleveland 3, Ohio.
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Columbus Die, Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Ingersoll Milling Machine Co., 2442 Douglas St., Rockford, Ill.
Jahn, B., Manufacturing Co., Ellis St., New Britain, Conn.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Mathewson Machine Works, Inc., 28 Hancock St., Quincy 71, Mass.
Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Woodworth, N. A., Co., 1300 E. Nine Mile Rd., Detroit 20, Mich.

JOINTS, See Fittings, Hydraulic, Pneumatic, Etc.

KEYSEATERS

Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Consolidated Mch. Tool Co., Rochester, N. Y.
Davis Keyseater Co., 405 Exchange St., Rochester 8, N. Y.
Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.
Mitts & Merrill, 68 Holden St., Saginaw, Mich.
Morton Mfg. Co., Muskegon Heights, Mich.

KNURL HOLDERS

Brown & Sharpe Mfg. Co., Providence, R. I.
Pratt & Whitney, West Hartford 1, Conn.

KNURLING TOOLS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Pratt & Whitney, West Hartford 1, Conn.

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Barnes Drill Co. (Straight Line or Rotating), 814 Chestnut St., Rockford, Ill.
Cincinnati Grinders, Inc. (Centerless), Cincinnati, Ohio.
Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill. (Lapmaster Div.).
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Micromatic Hone Corp., 8100 Schoolcraft, Detroit 4, Mich.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

LAPPING PLATES, Hand

Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill.

LATHE AND GRINDING DOGS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

LATHE ATTACHMENTS

American Tool Works Co., Pearl and Eggleston Aves., Cincinnati, Ohio.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Oakley, Cincinnati 9, Ohio.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Hendey Machine Co., Inc., Torrington, Conn.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio.

(Continued on page 406)

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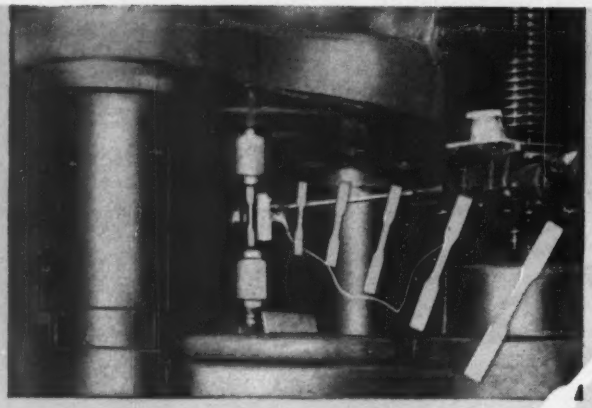

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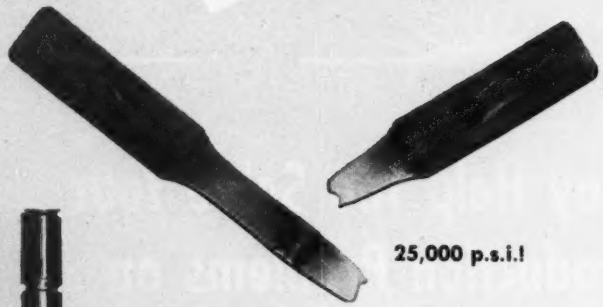

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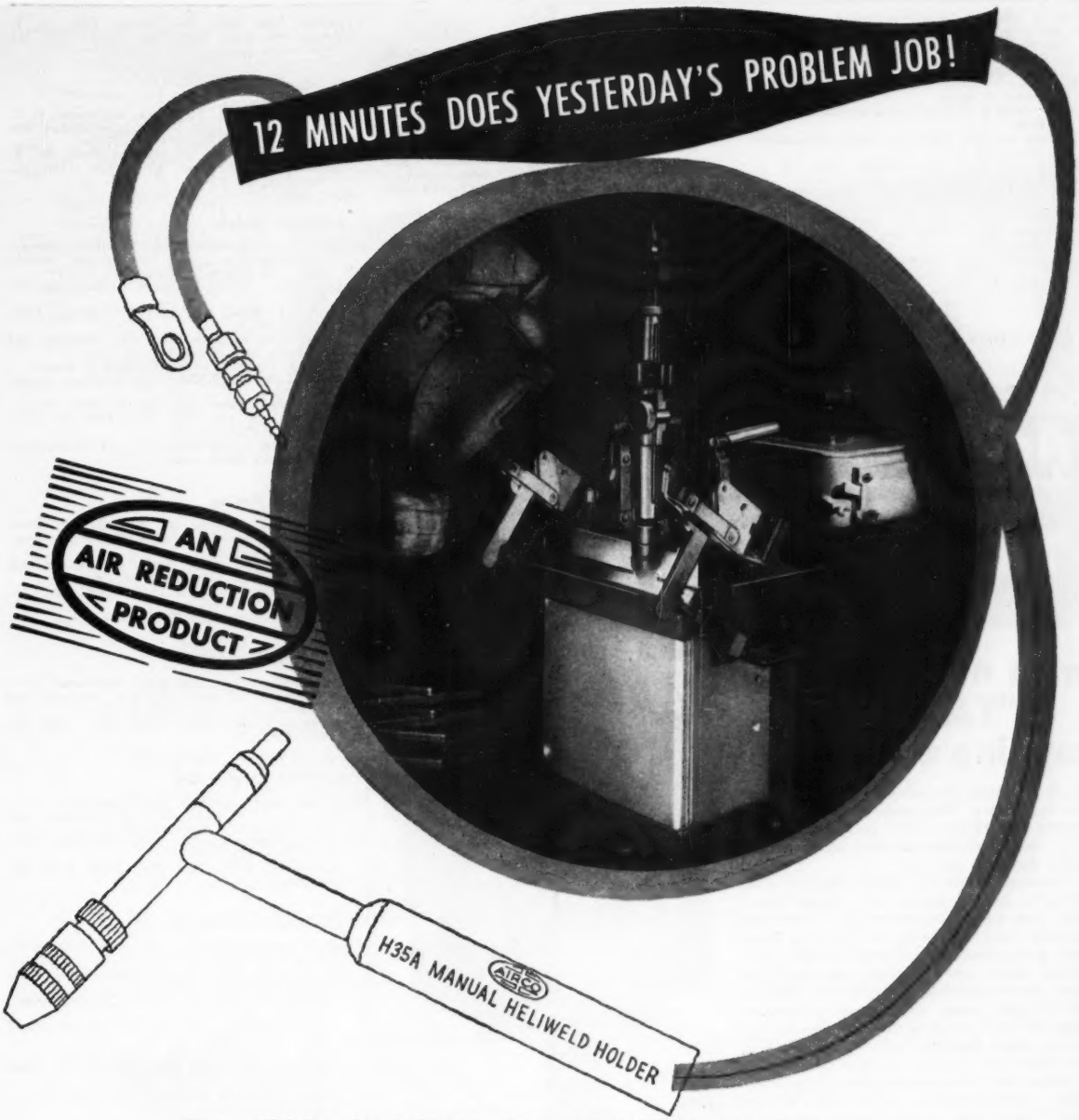

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Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sidney Machine Tool Co., Sidney, Ohio.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Springfield Mch. Tool Co., Springfield, Ohio.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Turnomat Co., Inc., Brockport, N. Y.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

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Cone Automatic Mch. Co., Inc., Windsor, Vt.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10 Wis.
Goss & DeLeeuw Mch. Co., Kensington, Conn.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Porter-Cable Machine Co., Salina St., Syracuse, N. Y.
Potter & Johnston Co., 1027 Newport Ave., Pawtucket, R. I.
Pratt & Whitney, West Hartford 1, Conn.
Russel, Holbrook & Henderson, Inc., 292 Madison Ave., New York 17, N. Y.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

LATHES, Axle

Consolidated Mch. Tool Corp., Rochester, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

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Ames Precision Mch. Works, Waltham, Mass.
British Industries Corp., International Mchry. Div., 164 Duane St., New York, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sheldon Mch. Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

LATHES, Boring

Bullard Co., Brewster St., Bridgeport 2, Conn.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Sidney Machine Tool Co., Sidney, Ohio.

LATHES, Crankshaft

Consolidated Mch. Tool Corp., Rochester, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

LATHES, Double-End

Consolidated Mch. Tool Corp., Rochester, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

LATHES, Duplicating

H.E.B. Machine Tools, Inc., 475 Fifth Ave., New York 17, N. Y.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Monarch Machine Tool Co., 27 Oak St., Sidney Ohio.
Sidney Machine Tool Co., Sidney, Ohio.
Triplex Machine Tool Corp., 75 West St., New York 6, N. Y.
Walker Hydraulic Duplicator Co., Box 200, Standish, Mich.

LATHES, Engine and Toolroom

American Tool Works Co., Pearl and Eggleston Aves., Cincinnati, Ohio.
Axelson Mfg. Co., P. O. Box 15335, Vernon Sta., Los Angeles 58, Calif.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Oakley, Cincinnati 9, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Greaves Mch. Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.
H.E.B. Machine Tools, Inc., 475 Fifth Ave., New York 17, N. Y.
Hendey Machine Co., Inc., Torrington, Conn.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Logan Engrg. Co., 4901 W. Lawrence Ave., Chicago 30, Ill.
Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio.
Morey Mchry. Co., Inc., 410 Broome St., New York, N. Y.
Nebel Machine Tool Co., 3401 Central Parkway, Cincinnati 25, Ohio.

(Continued on page 408)

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Truly a remarkable achievement in production machinery. This rugged miracle worker weighs only 18 lbs.—yet can tap through a 1½" steel plate with an ease and accuracy never dreamed possible.

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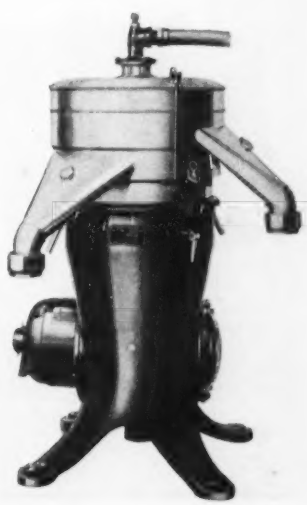

Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Seneca Falls Mch. Co., Seneca Falls, N. Y
Sheldon Machine Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.
Sidney Machine Tool Corp., Sidney, Ohio.
Simmons Machine Tool Corp., 1600 N. Broadway, Albany, N. Y.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Springfield Mch. Tool Co., Springfield, Ohio.

LATHES, Gap

Axelson Mfg. Co., P. O. Box 15335, Vernon Sta., Los Angeles 58, Calif.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Oakley, Cincinnati 9, Ohio.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
H.E.B. Machine Tools, Inc., 475 Fifth Ave., New York 17, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Nebel Machine Tool Co., 3401 Central Parkway, Cincinnati 25, Ohio.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sidney Machine Tool Corp., Sidney, Ohio.
Springfield Mch. Tool Co., Springfield, Ohio.
Warner & Swasey Co, 5701 Carnegie Ave., Cleveland 3, Ohio.

LATHES, Gun

Consolidated Mch. Tool Corp., Rochester, N. Y.
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Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

LATHES, Manufacturing Type

Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.

LATHES, Spinning

Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.
Ferracute Machine Co., Bridgeton, N. J.

LATHES, Toolroom

See Lathes, Engine and Toolroom.

LATHES, Turret

Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
British Industries Corp., International Mchry. Div., 164 Duane St., New York, N. Y.
Brown & Sharpe Mfg. Co., Providence, R. I.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Hardinge Brothers, Inc. (Bench or Cabinet Mounting), 1418 College Ave., Elmira, N. Y.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Millholland, W. K., Mchry. Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Morey Mchry. Co., Inc., 410 Broome St., New York, N. Y.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Potter & Johnston Co. (Automatic), 1027 Newport Ave., Pawtucket, R. I.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Simmons Mch. Tool Corp., 1600 N. Broadway, Albany, N. Y.
South Bend Lathe Works, 425 E. Madison St., South Bend, Ind.
Springfield Mch. Tool Co., Springfield, Ohio.
Triplex Machine Tool Corp., 75 West St., New York 6, N. Y.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

LATHES, Vertical Turret

American Steel Foundries, King Mch. Tool Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Lehmann, J. M., Co., Inc. 55 New York Ave, Lynhurst, N. J.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.

LEVELS

Bullard Co., Brewster St., Bridgeport 2, Conn.
Millers Falls Co., Greenfield, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

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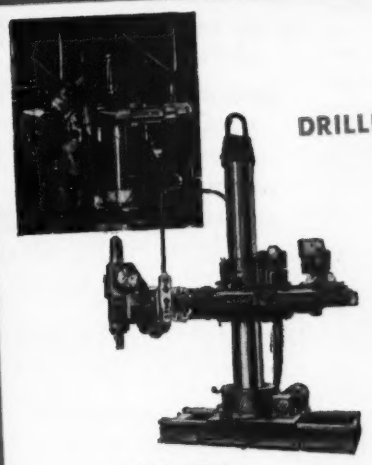
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Lubriplate Div., Fiske Bros. Refining Co., 129 Lockwood St., Newark 5, N. J.

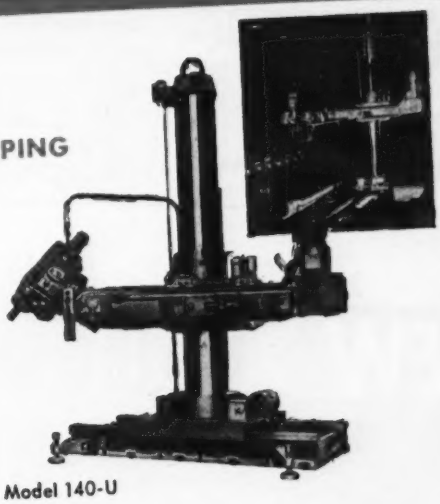
(Continued on page 410)

Kaukauna UNIVERSAL AND HORIZONTAL DRILLING AND TAPPING Machines

UNIVERSAL DRILLING and TAPPING MACHINES



Model 125-U



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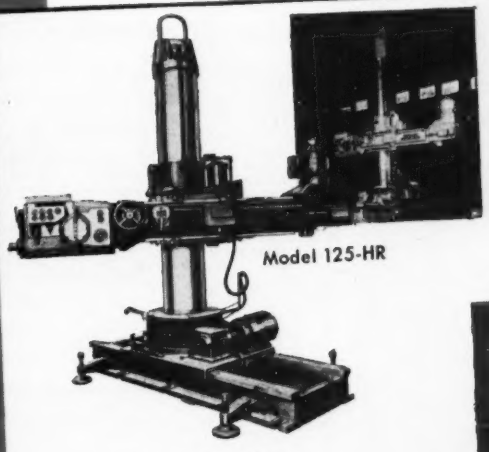
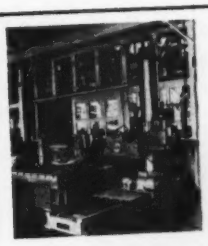
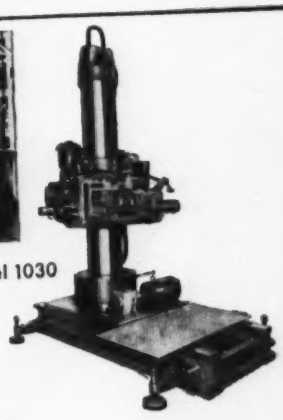


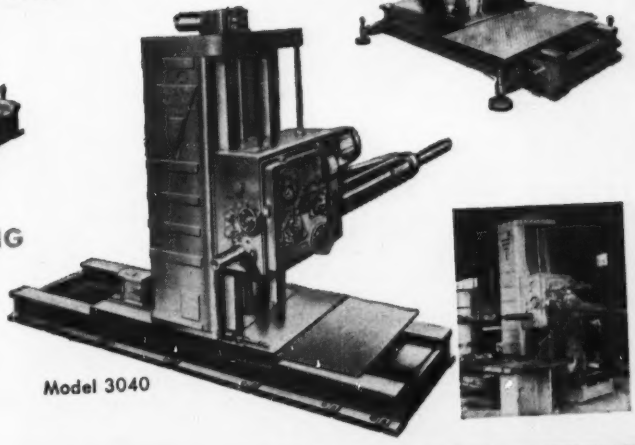
Model 125-HR





Model 1030

HORIZONTAL DRILLING and TAPPING MACHINES



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Norma-Hoffmann Bearings Corp., Stamford, Conn.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.

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Taft-Peirce Mfg. Co., Woonsocket, R. I.

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METERS

See Recording Instruments.

MICROMETERS

Ames, B. C., Co. (Dial), Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Millers Falls Co., Greenfield, Mass.
Neise, Karl, A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.

MICROSCOPES, Toolmakers

Engis Equipment Co., 431 S. Dearborn St., Chicago 5, Ill.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

MILLING ATTACHMENTS

Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Machine Tool Corp., Rochester, N. Y.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Kempsmith Machine Co., 1819 S. 71st St., Milwaukee 14, Wis.
Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

MILLING AND CENTERING MACHINES

Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Jones & Lamson Mch. Co. (Automatic), 160 Clinton St., Springfield, Vt.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Automatic

Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Machine Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Hall Planetary Co., Fox St. and Abbotsford Ave., Philadelphia 29, Pa.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Kearney & Trecker Corp., Milwaukee, Wis.
Pratt & Whitney, West Hartford 1, Conn.

(Continued on page 412)

NEW boring tool set
by PORTAGE
Quick Change
FOR
• BORING MILLS
• TURRET LATHES
• MILLING MACHINES
P. D. Q.
(Portage Double Quick)
Featuring the new...
.... TRIPLE lock grip
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No. 40 & 50 Milling Machine Tapers
Holders designed to fit any application.
PORTAGE opens a new era in Quick Change Tools. Tapered contact with the new TRIPLE LOCK, assures faster tool change, positive repositioning, greater rigidity and longer wear life. A really COMPLETE set for BORING, MILLING and TURRET LATHE use. Also supplied (if desired) is a wooden rack especially designed for the set.
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of operations performed on

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1. STRADDLE MILLS inside and outside of 4 pads
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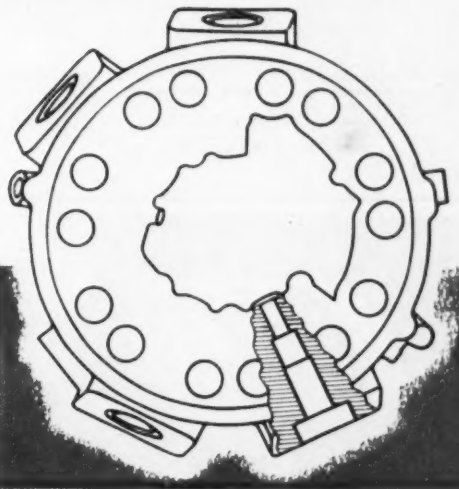
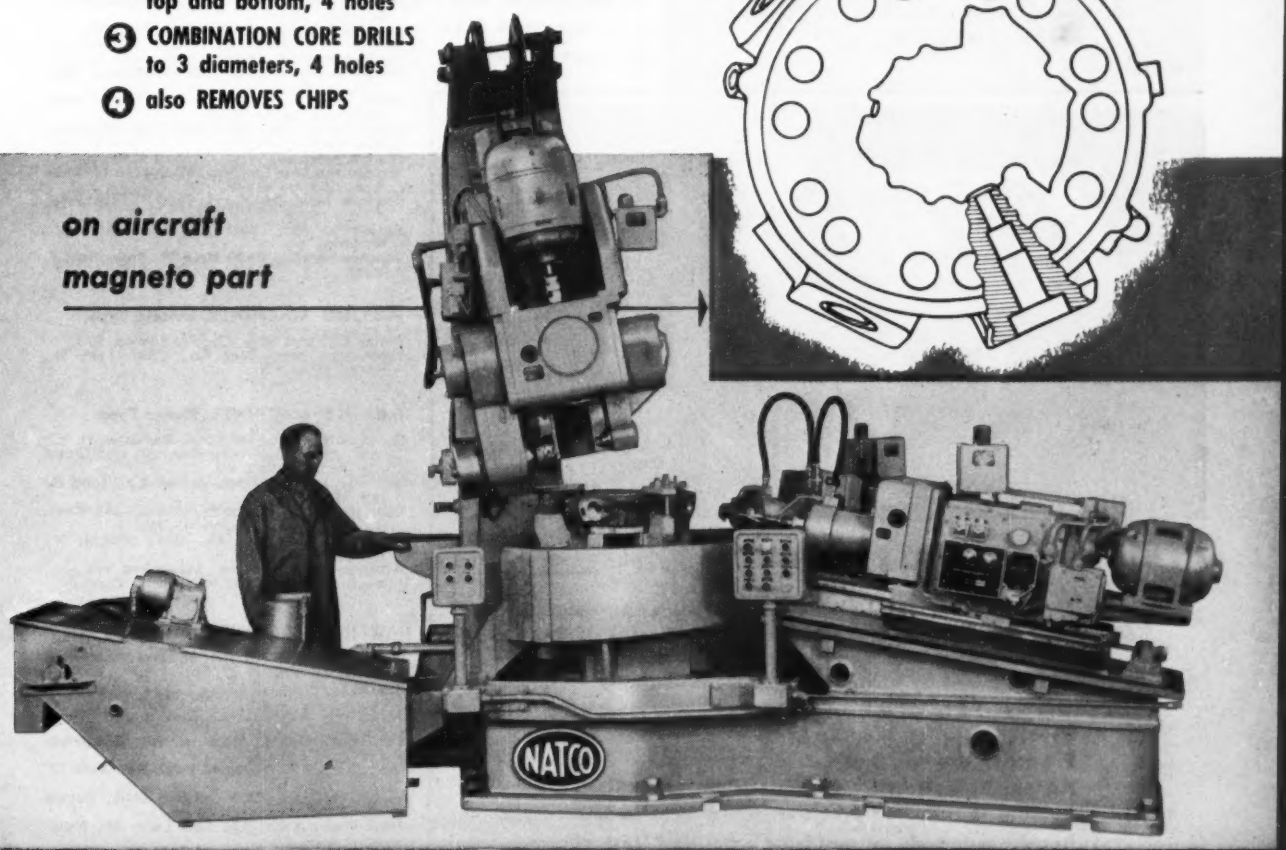
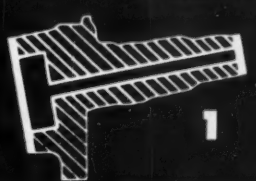
4. also REMOVES CHIPS



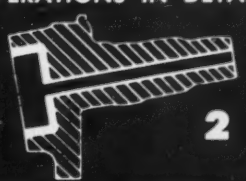
on aircraft magneto part



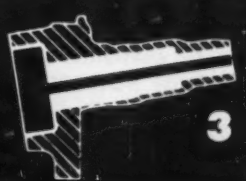
OPERATIONS IN DETAIL



Straddle Mills inside and outside of 4 pads



Combination Counterbores and Chamfers top and bottom, 4 holes



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U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

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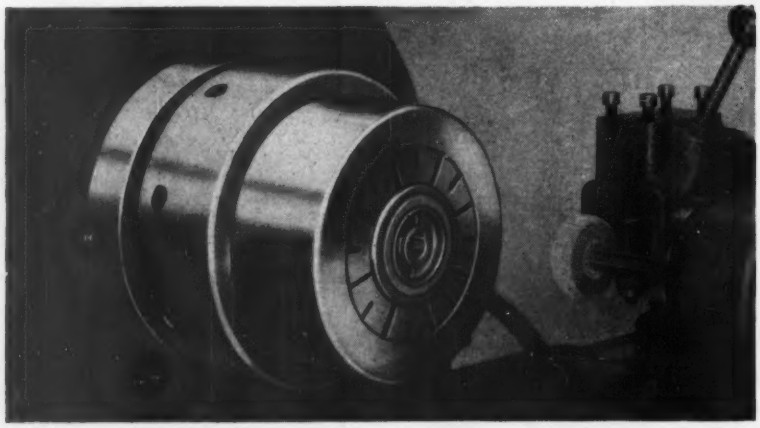
Consolidated Machine Tool Corp., Rochester, N. Y.
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Espen-Lucas Mch. Works, Front St. and Girard Ave., Philadelphia, Pa.
Hall Planetary Co., Fox St. and Abbotsford Ave., Philadelphia 29, Pa.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Duplex

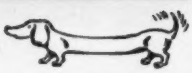
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Machine Tool Corp., Rochester, N. Y.
Espen-Lucas Mch. Works, Front St. and Girard Ave., Philadelphia, Pa.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Nichols-Morris Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

MILLING MACHINES, Hand

Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Nichols-Morris Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.



The tail that wags the dog...



In today's industrial plants, where greater precision and more production are essential to successful operation, the efficiency and speed of costly machines are all too often limited by obsolete work or tool holding methods.

The need for a "tail to fit the dog" has resulted in the development of the world famous line of ERICKSON Precision Holding Tools.

An example illustrated above is an ERICKSON CHUCK holding a rotor for precision grinding of a shaft hole.

Results reported: concentricity is assured, cost of operation reduced drastically, rejects eliminated.

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Van Norman Co., 3640 Main St., Springfield 7, Mass.

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Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Machine Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis
Greaves Mch. Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Kempsmith Machine Co., 1819 S. 71st St., Milwaukee 14, Wis.
Marac Mchry. Corp., 1819 Broadway, New York, N. Y.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Sheldon Machine Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.
Simmons Mch. Tool Corp., 1600 N. Broadway, Albany, N. Y.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

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Brown & Sharpe Mfg. Co., Providence, R. I.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Planer Type

Consolidated Mch. Tool Corp., Rochester, N. Y.
Espen-Lucas Mch. Works, Front St. and Girard Ave., Philadelphia, Pa.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A., Co., Woodburn Ave. and Penn. R. R. Evanston, Cincinnati, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Pratt & Whitney, West Hartford 1, Conn.

MILLING MACHINES, Planetary Type

Hall Planetary Co., Fox St. and Abbotsford Ave., Philadelphia 29, Pa.

MILLING MACHINES, Profile

Cincinnati Milling Machine Co., Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Ram Type Universal

Fray Machine Tool Co., 515 W. Windsor Rd., Glendale 4, Calif.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

MILLING MACHINES, Turret Type

Bridgeport Machines, Inc., Linley Ave., Bridgeport, Conn.

MILLING MACHINES, Vertical

British Industries Corp., International Mchry. Div., 164 Duane St., New York, N. Y.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Ekstrom, Carlson & Co., 1437 Railroad Ave., Rockford, Ill.

(Continued on page 414)

An IDLE man at a BUSY automatic spells PROFIT.
¶ A BUSY man at an IDLE machine spells LOSS.
¶ H&G Insert Chaser Die Heads are preferred by screw machine engineers because they spell less down time, lower costs, cleaner, more accurate threads.

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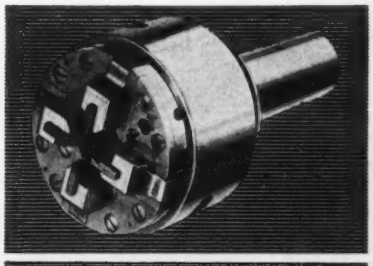
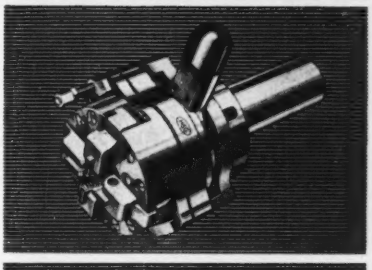
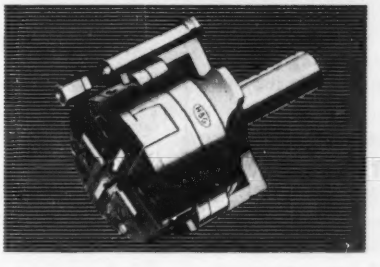
for multiple spindle automatics, chucking machines, drill presses.



Style DMS
for hand screw machines, turret lathes, where die head does not rotate.



Style DM
for B & S automatics and small spindle machines.



H&G Insert Chaser DIE HEADS

WRITE FOR "HOW TO SELECT THE PROPER DIE HEAD FOR THE JOB".

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Marac Mchry. Co., 1819 Broadway, New York, N. Y.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
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Pratt & Whitney, West Hartford 1, Conn.
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Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
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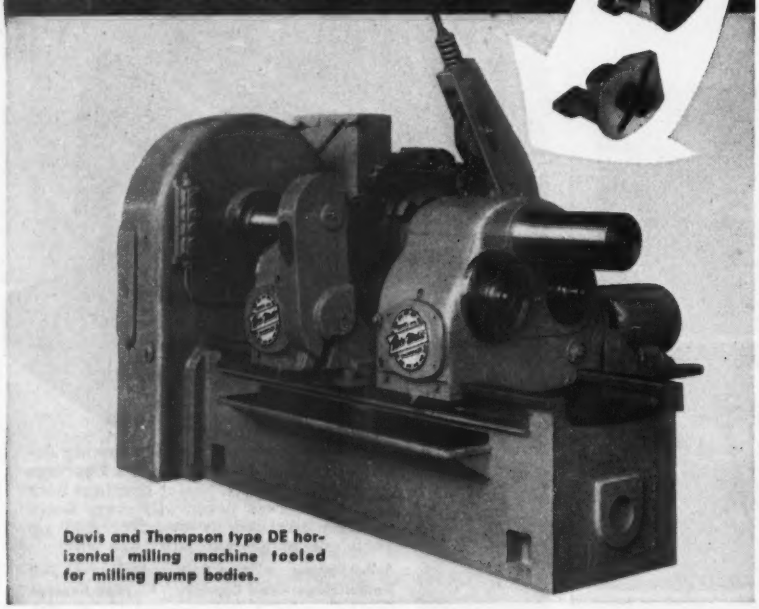
264 Pump Bodies Per Hour . . . . . .



Davis and Thompson type DE horizontal milling machine tooled for milling pump bodies.

1-A Standard Horizontal Milling Machine

Oil pump bodies requiring high degree of finish and high production are rough and finish milled on both sides simultaneously with this Davis and Thompson type DE milling machine. Production is 264 pieces per hour.

Patented Angular Spindle Adjustment Allows "Toe Cutting"—Maintains Fine Finish at High Production

The finishing spindle is provided with an exclusive D&T design which allows angular adjustment. This in turn results in "toe-cutting" and eliminates "drag" of the cutter over the finished surface. Both roughing and finishing spindles have micrometer endwise adjustment.

A Basically Standard Machine Employing Roto-Matic Principle For High Production Special Milling

Like all D&T machines this model DE is designed for long life and trouble-free operation. Each head has independent drive. There is backleash take up to mandrel. Anti-friction bearings throughout. Rapid traverse between cuts can be incorporated.

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Campbell Machine Div., American Chain & Cable Co., Inc., 929 Connecticut Ave., Bridgeport, Conn.

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International Nickel Co., Inc., 67 Wall St., New York, N. Y.

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Landis Machine Co., Inc., Waynesboro, Pa.

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National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.

NUT SETTING EQUIPMENT

See Screw Driving and Nut Setting Equipment.

NUT TAPPERS

See Bolt and Nut Machinery.

NUTS, Cold Forged, Wing and Cap

Chicago Screw Co., Bellwood, Ill.
Parker-Kalon Corp., 200 Varick St., New York 14, N. Y.
Republic Steel Corp. (Union Drawn Steel Div.), Republic Bldg., Cleveland 1, Ohio.
Union Drawn Steel Co. Div., Republic Steel Corp., Massillon, Ohio.

NUTS, Self-Locking

Grip Nut Co., 310 S. Michigan Ave., Chicago 4, Ill.

NUTS, Thumb or Wing and Cap

Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
Republic Steel Corp., Bolt and Nut Div., Republic Bldg., Cleveland 1, Ohio.

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OIL-HOLE COVERS

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OIL SEALS

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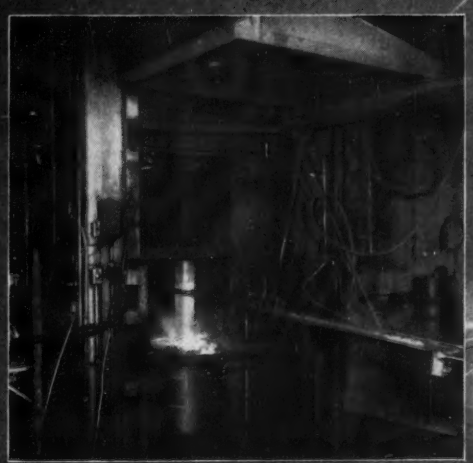
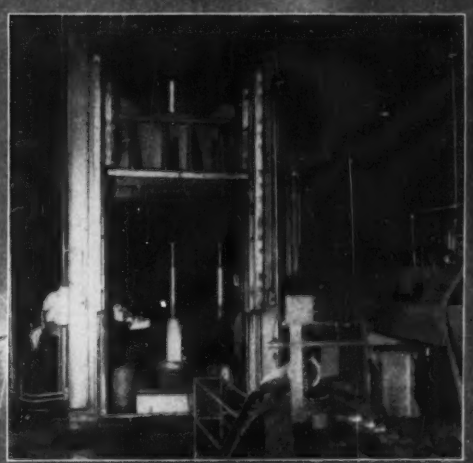
Garlock Packing Co., Palmyra, N. Y.

(Continued on page 416)

MASS PRODUCTION of projectiles with Verson PRESSES AND TOOLING for greater production and lower costs!



Piercing a steel billet in a 600 ton Verson hydraulic press.



Here a Verson hydraulic push through press sizes the cavity and O.D. of the steel forging.

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See Cutting and Grinding Fluids.

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DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Gulf Oil Corp., Gulf Bldg., Pittsburgh 30, Pa.
Houghton & Co., E. F., 303 W. Lehigh Ave., Philadelphia, Pa.
Sinclair Refining Co., 630 5th Ave., New York, N. Y.
Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart Oil Co., Ltd., D. A., 2739 S. Troy St., Chicago 23, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.
Tide Water Associated Oil Co., 17 Battery Place, New York, N. Y.

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Cities Service Oil Co., 70 Pine St., New York, N. Y.
Gulf Oil Corp., Gulf Bldg., Pittsburgh 30, Pa.
Houghton & Co., E. F., 303 W. Lehigh Ave., Philadelphia, Pa.
Sinclair Refining Co., 630 5th Ave., New York, N. Y.
Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart Oil Co., Ltd., D. A., 2739 S. Troy St., Chicago 23, Ill.

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Houghton & Co., E. F., 303 W. Lehigh Ave., Philadelphia, Pa.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

PARALLELS

Brown & Sharpe Mfg. Co., Providence, R. I.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker, O. S., Co., Inc., Worcester, Mass.

PATTERNS, Wood and Metal

Mummert-Dixon Co., Hanover, Pa.

PHOSPHOR BRONZE—See Bronze.

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C & C Sales Corp., 1771 Broadway, New York 19, N. Y.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis 6, Ind.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
Shafer Bearing Corp., Downers Grove, Ill.
S K F Industries, Inc., P. O. Box 6731, North Philadelphia, Pa.
Standard Pressed Steel Co., Jenkintown, Pa.

(Continued on page 418)

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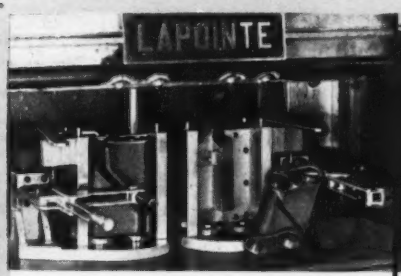
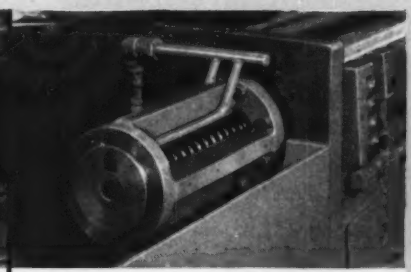
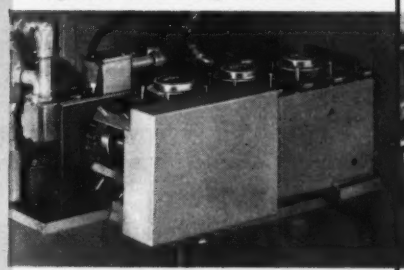


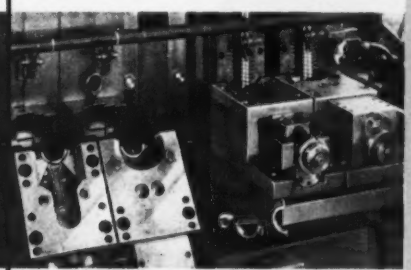
Close tolerance and exact spacing of holes in tank track shoes are made possible by this Lapointe V-8 Broaching Machine fixture.



Broach die-holding fixture, specially designed for easy coolant access and disposal of chips.

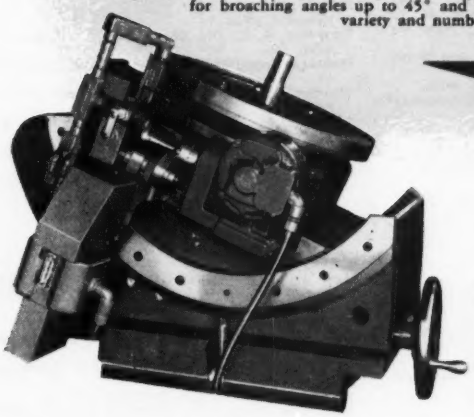


Operated unattended because of several built-in safety features, the Lapointe VU-3 Broaching Machine can broach helical splines in automotive gears through the use of this conveyor fixture.



The "Tip-Down" Fixture, exclusive with Lapointe, tips down to a position for easy loading, minimizes operator fatigue. Shown here on 15-ton Lapointe DRV Machine, for broaching connecting rods and caps.

Lapointe Universal Compound Angle Indexing Fixture, for broaching angles up to 45° and maximum variety and number of slots.



Varied fixture requirements of the different types of broaching machines — single ram and double ram, vertical and horizontal — call for engineering skill in fixture design that can only be gained through long experience. Lapointe engineers, with their 50 years of background, can refer to countless designs involving fixture principles that show remarkable ingenuity.

Whether, therefore, your need is for a broaching fixture that is simple or complex, manual or automatic, come to "fixture headquarters" . . . come to **LAPOINTE.**

Literature on broaching machine fixtures can be obtained by addressing Department 1.

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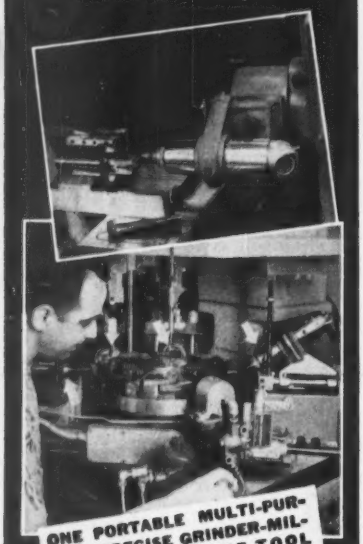

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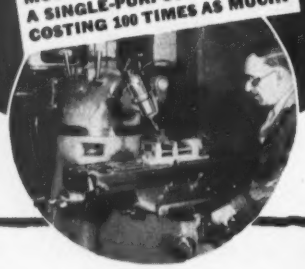

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Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
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Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.

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Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
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Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Ingersoll-Rand Co., Phillipsburg, N. J.
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Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.

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POWER UNITS, Hydraulic

See Hydraulic Power Units or Tool Heads.

PRESSES, Air

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Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Farquhar, A. B., Div. Oliver Corp., 21 Duke St., York, Pa.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
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Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
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Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wilson, K. R., 215 Main St., Buffalo, N. Y.

PRESSES, Broaching

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Colonial Broach Co., Detroit 13, Mich.
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Farquhar, A. B., Div. Oliver Corp., 21 Duke St., York, Pa.
Ferracute Machine Co., Bridgeton, N. J.
Lake Erie Engrg. Co., Kenmore Station, Buffalo, N. Y.
Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

PRESSES, Die Tryout

Alpha Tool Works, 9281 Freeland Ave., Detroit 28, Mich.

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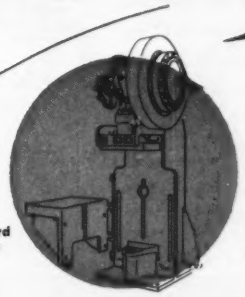
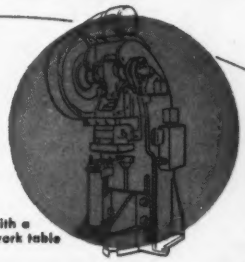
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.

(Continued on page 420)

A Multi-purpose Press You Can Keep Busy All the Time



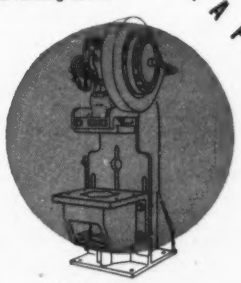
Used as a standard gap-frame press



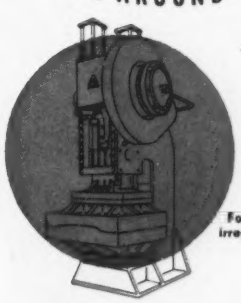
Used with a traversing work table

For regular horn press operations

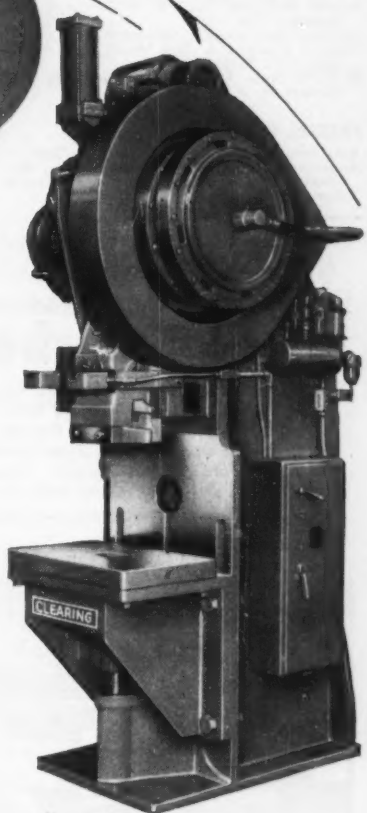
As used with special feeding device



As used with a die cushion



For large or irregular parts



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Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Ferracute Machine Co., Bridgeton, N. J.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.

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Bethlehem Steel Co., Bethlehem, Pa.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.
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Ferracute Machine Co., Bridgeton, N. J.
Henry & Wright Div., Emhart Mfg. Co., 760 Windsor St., Hartford 1, Conn.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
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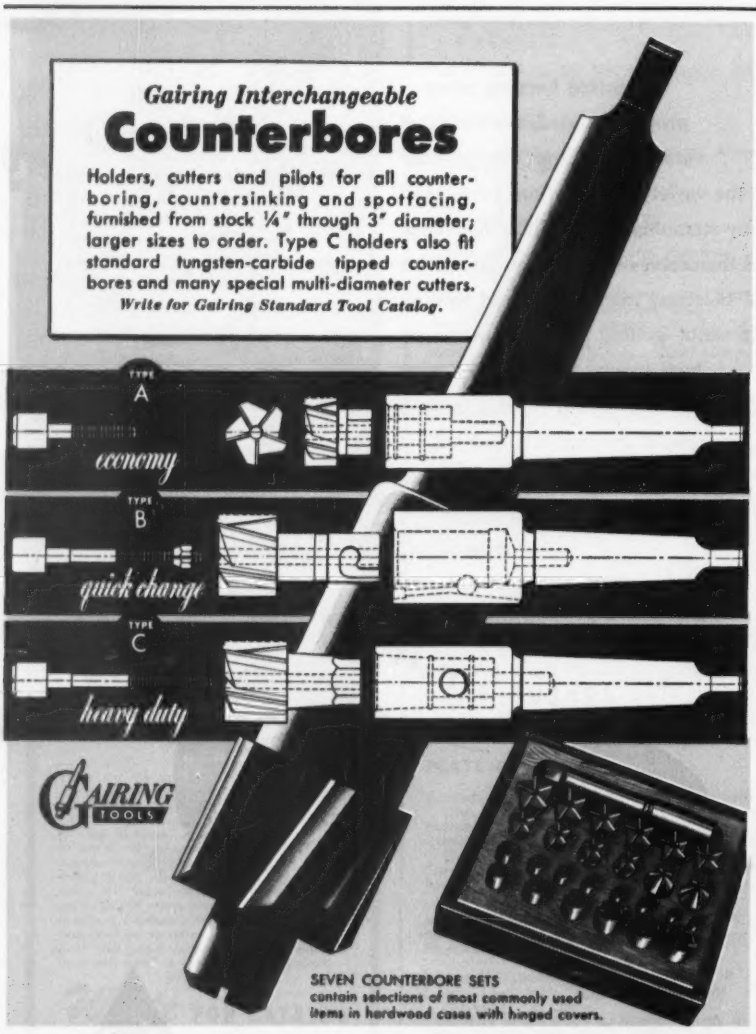
National Mchry. Co., Greenfield and Stanton Sts., Tiffin, Ohio.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.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Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.
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Chambersburg Engrg. Co., Chambersburg, Pa.
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Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.
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Wood, R. D., Co., Public Ledger Bldg., Philadelphia 5, Pa.

PRESSES, Pneumatic

Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.

PRESSES, Screw

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Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
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Farquhar, A. B., Div. Oliver Corp., 21 Duke St., York, Pa.
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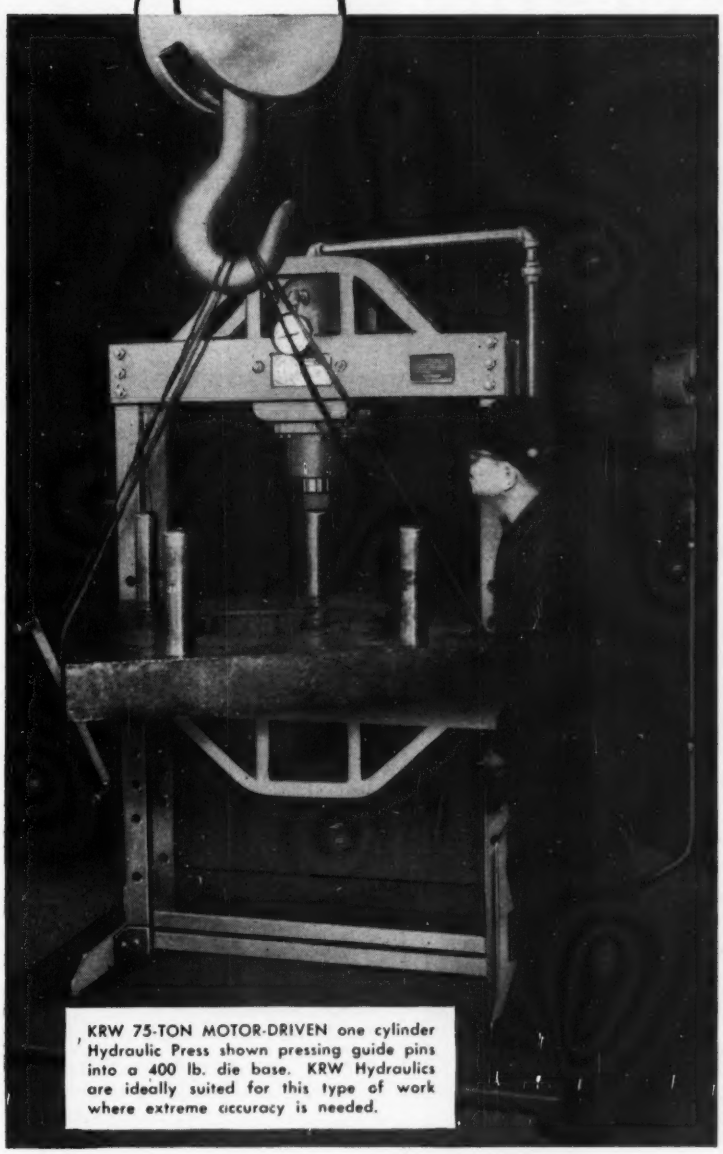
(Continued on page 422)

KRW PRESS

Does its daily dozen

. . . and big ones like this are just routine!



KRW 75-TON MOTOR-DRIVEN one cylinder Hydraulic Press shown pressing guide pins into a 400 lb. die base. KRW Hydraulics are ideally suited for this type of work where extreme accuracy is needed.

That's a 400 pound die base in the KRW Hydraulic Press at left. Offhand you might think that it's biting off more than it can chew. But not this press! It's been doing a dozen jobs like this **daily** for two years.

The Press is used in the Specialty Shop of a large steel company which makes everything from ornamental iron railings to end "spiders" for lawn mowers. It does a wide variety of jobs such as pressing pins in bearings, straightening bent roll shafts, pressing die shanks into punch holders and compressing springs on die strippers before dismantling dies — an important safety feature in this Shop.

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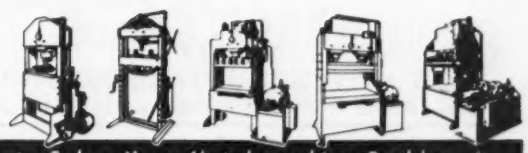

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Wilson, K. R., 215 Main St., Buffalo, N. Y.
Zeh & Hahnemann Co., 182 Vanderpool St., Newark, N. J.

PRESSES, Straightening

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Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio.
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Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.
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Morgan Engrg. Co., Alliance, Ohio.
Niagara Mch. & Tool Works (Hydraulic), 683 Northland Ave., Buffalo, N. Y.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Springfield Mch. Tool Co., Springfield, Ohio.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wilson, K. R., 215 Main St., Buffalo, N. Y.

PROFILING MACHINES

Consolidated Mch. Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Gorton, George, Machin Co., 1110 W. 13th St., Racine, Wis.
Morey Mchry. Co., Inc. (and Affiliated companies), 410 Broome St., New York, N. Y.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

PULLEYS

Boston Gear Works, 3200 Main St., North Quincy 71 Mass.
Pull Gear Co., 21125 Dequindre St., Hazel Park, Mich.

PULLEYS, Friction Clutch

Brown & Sharpe Mfg. Co., Providence, R. I.

PUMPS, Coolant, Lubricant and Oil

Brown & Sharpe Mfg. Co., Providence, R. I.
Delta Power Tool Div., Rockwell Mfg. Co., 620 E. Vienna Ave., Milwaukee, Wis.
Ingersoll-Rand Co., Phillipsburg, N. J.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Pioneer Pump & Mfg. Co., 19679 John R St., Detroit, Mich.
Ruthman Machinery Co., 1809 Reading Rd., Cincinnati 12, Ohio.
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Tomkins-Johnson Co., Jackson, Mich.
Tuthill Pump Co., 939 E. 95th St., Chicago 19, Ill.
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.
Viking Pump Co., Cedar Falls, Iowa.

PUMPS, Hydraulic

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Barnes, John S., Corp., Rockford, Ill.
Bethlehem Steel Co., Bethlehem, Pa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Chambersburg Engrg. Co., Chambersburg, Pa.
Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.
Gerotor May Corp., Oliver St. and Maryland Ave., Baltimore, Md.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Ingersoll-Rand Co., Phillipsburg, N. J.
Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.
Tuthill Pump Co., 939 E. 95th St., Chicago 19, Ill.
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.
Viking Pump Co., Cedar Falls, Iowa.
Vinco Corp., 9113 Schaefer Highway, Detroit 28, Mich.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

PUMPS, Pneumatic

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.
Ingersoll-Rand Co., Phillipsburg, N. J.

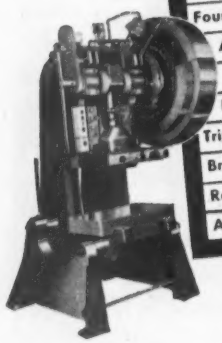
PUMPS, Rotary

Brown & Sharpe Mfg. Co., Providence, R. I.
Pioneer Pump & Mfg. Co., 19679 John R St., Detroit, Mich.
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.
Tuthill Pump Co., 939 E. 95th St., Chicago 19, Ill.
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.
Viking Pump Co., Cedar Falls, Iowa.

(Continued on page 424)

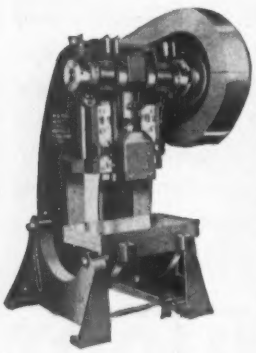
How does YOUR PRESS check out?

STANDARD PRESS FEATURES	PRESS-RITE	YOUR PRESS
Uni-Cast Frame	✓	
Anti-Friction Roller Bearings in Flywheel	✓	
Four Point Engagement Sliding Clutch Key	✓	
Automatic Cam Operated Brake	✓	
Cam Operated Single Stroke Safety Mechanism	✓	
Built-In Tie Rods	✓	
Triple Ramway Lubrication	✓	
Bronze Bushed Main Bearings	✓	
Replaceable Die Shank Bushing	✓	
Airflex Friction Clutch (optional at extra cost)	✓	



No. 60—60 Tons
Air Clutch Equipped

PRESS-RITE
POWER
PRESSES



No. 85—85 Tons

Now You Get All These Features in *One* Press . . . the Press-Rite Press. Buy Press-Rite Presses today and get increased production . . . longer die life . . . greater operator confidence . . . longer press life . . . and scores of other benefits. Press-Rite Presses help to cut your operating expenses and eliminate costly down time. Find out more about Press-Rite Presses today.

GET ALL THE FACTS
About Press-Rite Press features, together with specifications. A complete line of 8 models from 5 to 85 tons capacity.

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Sales Service Machine Tool Co. SSMT
PRESS RITE PRESSES • SHAPE RITE SHAPERS • KELLER POWER HACK SAWS
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Announcing

the new "FETTE" PATENT thread rolling head

self-opening

Exclusively by

NATIONAL ACME

more accurate

stronger

smoother

cheaper

and 5 times faster than die head thread chasing

This new precision method of chipless thread forming embraces features resulting in economies to an extent found in no other tool.

The method produces a highly densified thread surface, wear resistant and exceptionally smooth. Feed of work follows lead of thread—no lead screw or follow-up cam required.

Rolling speeds are equivalent to turning speeds of same materials with high speed tools. Many thousands of linear feet can be rolled with one set of thread rolls.

Annular grooved rolls are positioned in plates in the head and plates are not changed for standard coarse or fine pitch of same thread form. Fine diametric adjustment is provided.

Further economies result in the small initial purchase price of the head as against special single purpose thread rolling machines.

Both revolving or non-revolving heads are suited to all horizontal or vertical machines. Currently built in 3 standard sizes covering range ¼ to ¾" National coarse or fine straight threads. Other sizes and forms of application.

Material rolled flows in an axial direction so that the thread is generated ahead of the rolls causing metal to flow to the full depth of thread, also eliminating broken grain structure at crest of thread.

Manufactured and sold in U. S. A. only by the makers of NAMCO CIRCULAR CHASER SELF OPENING VERS-O-TOOL HEADS AND COLLAPSIBLE TAPS

The NATIONAL ACME COMPANY

170 EAST 131 STREET • CLEVELAND 8, OHIO

How CONE-DRIVE
gears improve
your equipment
ALL TEETH IN CONTACT
45
You can be sure, if the equipment you purchased is operated through Cone-Drive gears or speed reducers, that the manufacturer is giving you "the best."
The secret of Cone-Drive gears and speed reducers is their double enveloping action. Double enveloping—the worm wrapped around the gear, the gear wrapped around the worm—means far greater load capacity for a given gear size, amazing smoothness, greater shock load capacity, far longer life expectancy and trouble-free operation.
Ask if the equipment you buy has double enveloping Cone-Drive gears or speed reducers if you, too, want "the best at the lowest cost."
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DOUBLE ENVELOPING GEAR SETS & SPEED REDUCERS
Michigan Tool Company
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PUNCHES AND DIES

See Dies, Sheet Metal, Etc.

PUNCHES, Centering

Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.

PUNCHING MACHINERY

Bath, Cyril, Co., 6984 Machinery Ave., Cleveland 3, Ohio.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Ferracute Machine Co., Bridgeton, N. J.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
O'Neil-Irwin Mfg. Co., Lake City, Minn.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wiedemann Machine Co., 4272 Wissahickon Ave., Philadelphia, Pa.

PYROMETERS

Bristol Co., Platts Mills, Waterbury, Conn.

RACKS, Gear Cut

Atlantic Gear Works, Inc., 200 Lafayette St., New York 12, N. Y.
Boston Gear Works, 3200 Main St., North Quincy 71, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Gear Specialties, Inc., 2635 W. Medill Ave., Chicago 47, Ill.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Massachusetts Gear & Tool Co., 36 Nassau St., Woburn, Mass.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.

REAMER HOLDERS

Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Warner & Swasey Co., 8701 Carnegie Ave., Cleveland 3, Ohio.

REAMERS

Atrax Co., Newington, Conn.
Barber-Colman Co., Rock and Montague, Rockford, Ill.
Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 27, Mich.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.
Keo Cutters, 19326 Woodward, Detroit, Mich.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., & Winter Bros. Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Union Twist Drill Co., Athol, Mass.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

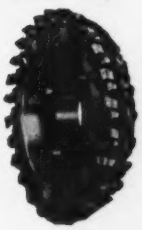
(Continued on page 426)

APEX TOOLS

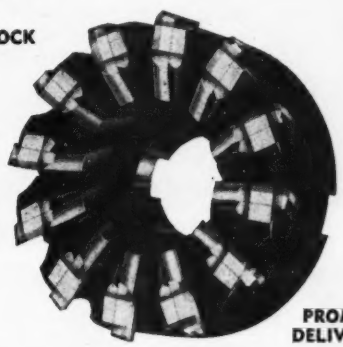
INSERTED-BLADE MILLING CUTTERS AND SINGLE-POINT TOOLS FOR ALL METAL-CUTTING NEEDS

APEX TOOL BITS FIT MOST STANDARD HOLDERS

If you haven't yet changed to Apex, you can get acquainted with APEX QUALITY by using Apex tool bits in your present holders. The Apex line includes Single-Point, Round Shank, as shown above, and Shankless Serrated. There are also Apex inserted-blade cutters of many styles: Millers, End Mills, Reamers, Slotters—you name it, we'll supply it!



FULL STOCK



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One of Many Apex Cutters for

HEAVY DUTY JOBS

Apex offers many millers for heavy duty jobs. Here is one that takes a big chip with speed. It may be had with H.S.S., Stellite, Cobalt or Carbide tips. The blades in this cutter adjust automatically in two directions. Diameters from 8" to 24". Apex also offers many types of heavy duty, single-point lathe, shaper and planer tools. Write for catalog.

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production begins with

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It takes the right machinery to build your product right! Columbus Die-Tool individually designs and builds tools, dies, and special machinery to produce your product alone. This gives you the advantages of lower operating cost, greater production and a higher quality product.

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Manufacturers of
JIGS • FIXTURES • BUILDING MACHINE TOOLS COMPLETE
SPECIAL TOOLS • UNITS FOR MACHINE TOOLS

REAMERS, Adjustable

Barber-Colman Co., Rock and Montague, Rockford, Ill.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Madison Mfg. Co., Muskegon Heights, Mich.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

REAMERS, Taper Pin

Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Kaufman Manufacturing Co., Manitowoc, Wis.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., & Winter Bros. Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.

REAMING MACHINES

Greaves Machine Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.
Kaufman Manufacturing Co., Manitowoc, Wis.
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
Pratt & Whitney, West Hartford 1, Conn.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

RECORDING INSTRUMENTS for Counting

National Acme Co., 170 E. 131st St., Cleveland, Ohio.

RECORDING INSTRUMENTS for Electricity

Bristol Co., Platts Mills, Waterbury, Conn.
General Electric Co., Schenectady, N. Y.

RECORDING INSTRUMENTS for Pressure

Bristol Co., Platts Mills, Waterbury, Conn.

RECORDING INSTRUMENTS for Speed

Bristol Co., Platts Mills, Waterbury, Conn.

RECORDING INSTRUMENTS for Temperature

Bristol Co., Platts Mills, Waterbury, Conn.

REELS, Stock, Standard and Automatic

Nilson, A. H., Mch. Co., 1506 Railroad Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

REFRACTORIES, Heat-Treating Furnace

Norton Co., 1 New Bond St., Worcester 6, Mass.

REGULATORS, Temperature

Bristol Co., Platts Mills, Waterbury, Conn.
General Electric Co., Schenectady, N. Y.

REMOVERS, Japan, Enamel, Etc.

Oakite Products, Inc., 19 Rector St., New York, N. Y

RETAINING RINGS FOR BEARINGS, Etc.

Nice Ball Bearing Co., Nicetown, Philadelphia, Pa.
Waldes-Kohinoor, Inc., 4716 Austel Place, Long Island City 1, N. Y.

RHEOSTATS

Allen-Bradley Co., 1326 S. 2nd St., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

RIVET SETS

Bethlehem Steel Co., Bethlehem, Pa.
Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Peck, Stow & Wilcox Co., Southington, Conn.

RIVETERS, Hydraulic

Bethlehem Steel Co., Bethlehem, Pa.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Hanna Engineering Works, 1752 Elston Ave., Chicago, Ill.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Morgan Engrg. Co., Alliance, Ohio.
Wood, R. D., Co., Public Ledger Bldg., Philadelphia 5, Pa.

RIVETERS, Pneumatic

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.
Grant Mfg. & Machine Co., 90 Silliman St., Bridgeport 5, Conn.
Ingersoll-Rand Co., Phillipsburg, N. J.
Keller Tool Co., Grand Haven, Mich.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

(Continued on page 428)

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MILLHOLLAND'S New AUTOMATIC BORING UNIT

Here's a new fixed center Horizontal Boring Mill unit that quickly gives you toolroom accuracy and production speeds—plus versatility!

Specially designed for short and medium run jobs, a single Millholland Automatic Boring Unit can be used for a variety of jobs, and one or more units can be mounted on a bed to perform a wide range of operations. Automatic operation replaces manual lever shifts, giving a complete automatic feed cycle. Hydraulic feeds are infinitely adjustable.

The body is heavily proportioned throughout for maximum rigidity. The hardened steel alloy spindle reciprocates thru hardened steel bushings mounted in the sleeve. The sleeve is contained in two precision Timken bearings.

SPECIFICATIONS

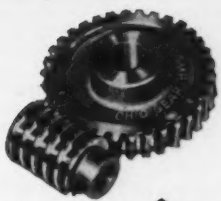
Horsepower	5 to 10	Diameter of spindle	3"
Spindle speeds by pick-off gears	33 to 500 rpm	Morse taper of spindle	No. 5
		Length of stroke	10"

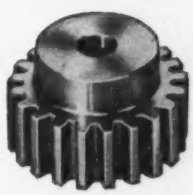
Send for Catalog M-411

Get more information about this new Millholland Automatic Boring Unit. Let us show you how efficiently they can be applied to many of your horizontal boring mill operations.

W. K. MILLHOLLAND MACHINERY COMPANY, INC.
6402 WESTFIELD BLVD.
INDIANAPOLIS 20, INDIANA

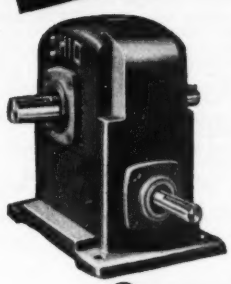
STANDARDIZE WITH OHIO STOCK GEARS AND SPEED REDUCERS

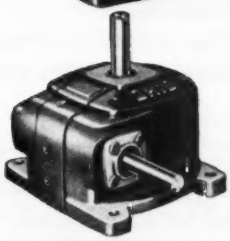


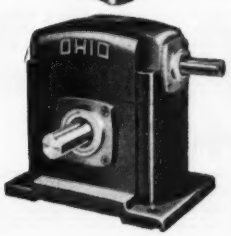


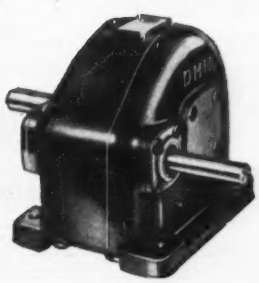
Meet today's tough production schedules "right off the shelf" with OHIO Gears and Speed Reducers. One glance through the pages of an Ohio Gear catalog and you immediately find ways to cut the cost and improve your product. Your production steps up automatically once you have adopted Ohio Gear as a "stock" source of supply.

Take advantage of Ohio Gear's years of engineering experience in every type of gear and speed reducer, the choice of thousands of engineers for the design and maintenance of power transmission equipment — Ohio Gear is prepared to meet your most difficult requirements. Call your nearest distributor or write direct.









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ESTABLISHED 1915

THE OHIO GEAR COMPANY

1331 EAST 179 STREET • CLEVELAND 10, OHIO

"THIS LUBRICANT INCREASED BEARING LIFE FROM 2 WEEKS TO 2 YEARS"

—says THE GLOBE COMPANY

"Animal acids and moisture, most harmful to ball and roller bearings prevails in the entire meat packing industry. With conventional lubricants, some of the bearings in our Roto-Cut machines did not last two weeks. Since using Ball Bearing LUBRIPLATE in machines operating continuously 24 hours a day for over two years, we have not had a single bearing replacement."

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REGARDLESS OF THE SIZE AND TYPE OF YOUR MACHINERY, LUBRIPLATE LUBRICANTS WILL IMPROVE ITS OPERATION AND REDUCE MAINTENANCE COSTS.

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Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Grant Mfg. & Machine Co., 90 Silliman St., Bridgeport 5, Conn.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Tomkins-Johnson Co., Jackson, Mich.

RIVET MAKING MACHINES

Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.

RUBBER PRODUCTS

Garlock Packing Co., Palmyra, N. Y.

RULES, Steel

Brown & Sharpe Mfg. Co., Providence, R. I.
Millers Falls Co., Greenfield, Mass.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass.

RUST PREVENTIVES

Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Oakite Products, Inc., 19 Rector St., New York, N. Y.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

SAND BLAST EQUIPMENT

See Blast Cleaning Equipment.

SANDERS

Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Ingersoll-Rand Co., Phillipsburg, N. J.
Jarvis, Charles L., Co., Middletown, Conn.
Keller Tool Co., Grand Haven, Mich.
Millers Falls Co., Greenfield, Mass.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

SAW BLADES, Hack

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
Atkins Saw Div., Borg-Warner Corp., 402 South Illinois St., Indianapolis 9, Ind.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Millers Falls Co., Greenfield, Mass.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Starrett, The L. S., Co., Athol, Mass.
Victor Saw Works, Inc., Middletown, N. Y.

SAW SHARPENING MACHINES

Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

SAWING MACHINES, Circular

Consolidated Mch. Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.

SAWING MACHINES, Friction

DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Tannewitz Works, 315 Front St., N. W., Grand Rapids 2, Mich.

SAWING MACHINES, Metal Cutting Band

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Grob Bros., Grafton, Wis.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Tannewitz Works, 315 Front St., N. W., Grand Rapids 2, Mich.
Walker-Turner Div., Kearney & Trecker Corp., South Ave., Plainfield, N. J.

SAWING MACHINES, Power Hack

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Victor Saw Works, Inc., Middletown, N. Y.

SAWS, Circular Metal Cutting

Atkins Saw Div., Borg-Warner Corp., 402 South Illinois St., Indianapolis 9, Ind.
Brown & Sharpe Mfg. Co., Providence, R. I.
Consolidated Mch. Tool Corp., Rochester, N. Y.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.
National Twist Drill & Tool Co., & Winter Bros. Co., Rochester, Mich.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Tannewitz Works, 315 Front St., N. W., Grand Rapids 2, Mich.
Triplex Machine Tool Corp., 75 West St., New York 6, N. Y.
Union Twist Drill Co., Athol, Mass.
Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.

SAWS, Metal Cutting Band

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
Atkins Saw Div., Borg-Warner Corp., 402 South Illinois St., Indianapolis 9, Ind.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Starrett, The L. S., Co., Athol, Mass.
Tannewitz Works, 315 Front St., N. W., Grand Rapids 2, Mich.
Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.

SAWS, Portable Electric

Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md.
Millers Falls Co., Greenfield, Ohio.

SAWS, Screw Slotting

Barber-Colman Co., Rock and Montague, Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., & Winter Bros. Co., Rochester, Mich.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Starrett, The L. S., Co., Athol, Mass.
Union Twist Drill Co., Athol, Mass.

SCRAPERS, Hand and Power

Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.

(Continued on page 430)

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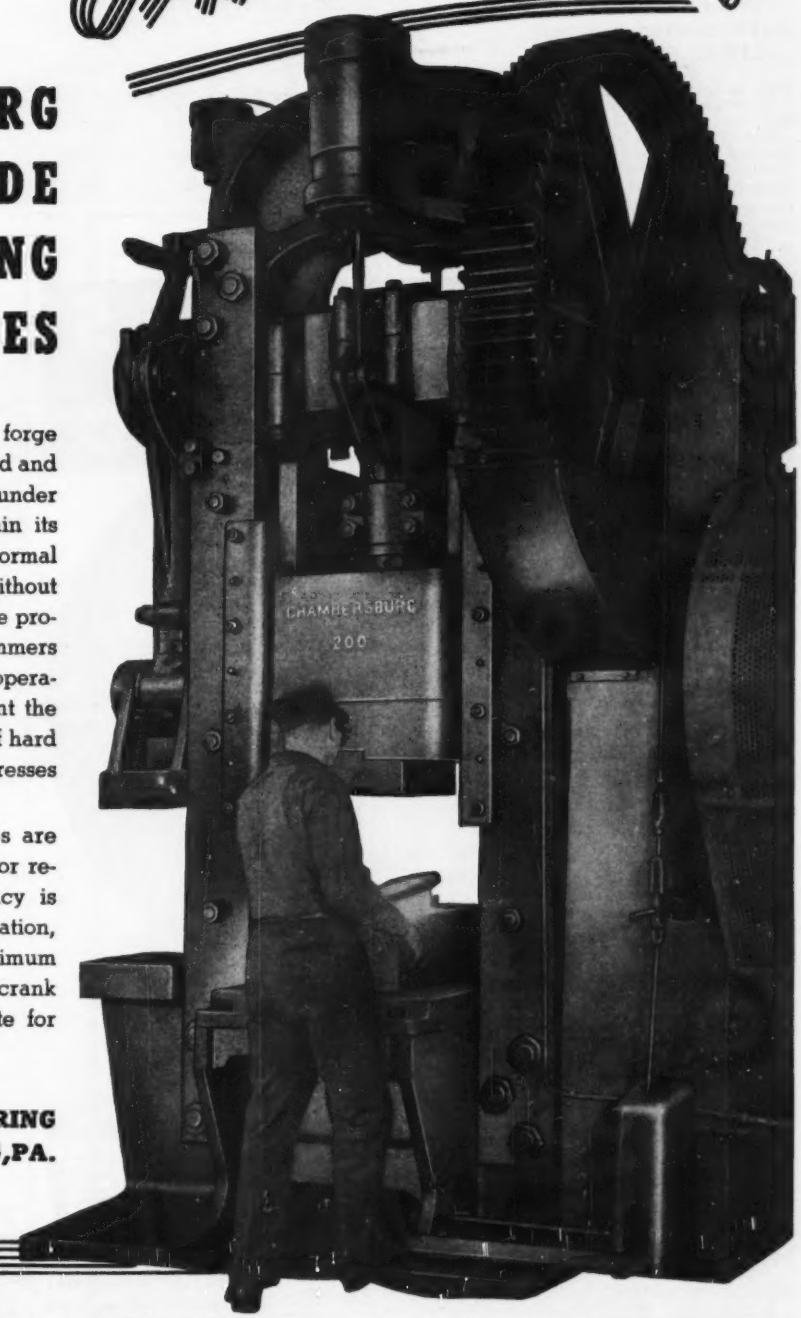

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Ingersoll-Rand Co., Phillipsburg, N. J.
Keller Tool Co., Grand Haven, Mich.

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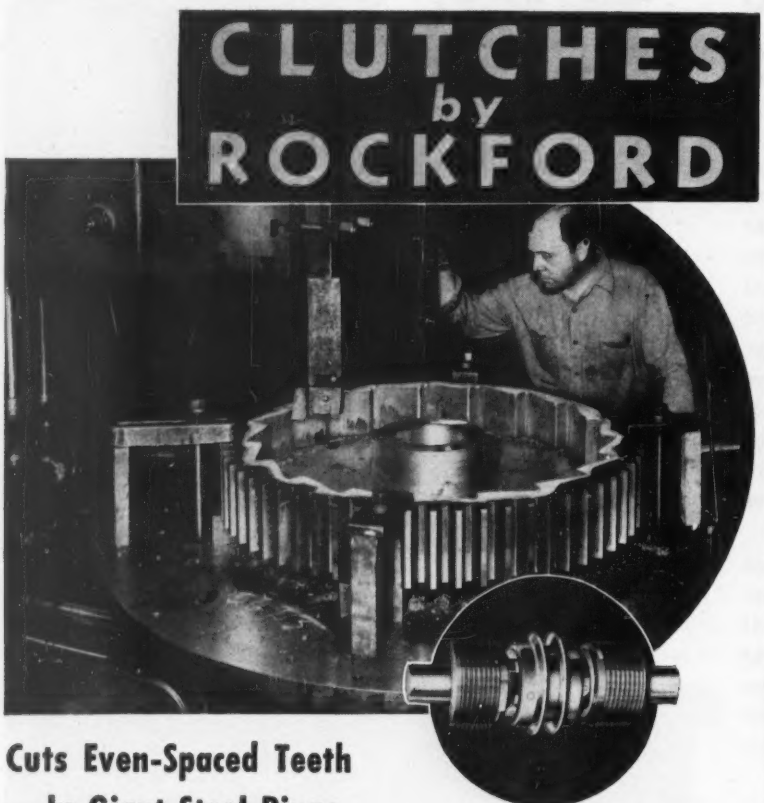
Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.
Errington Mechanical Laboratory, Inc., 24 Norwood Ave., Stapleton, S. I., N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.
Jarvis, Charles L., Co., Middletown, Conn.
Keller Tool Co., Grand Haven, Mich.

SCREW MACHINE TOOLS AND EQUIPMENT

Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.
Millers Falls Co., Greenfield, Mass.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Potter & Johnston Co., 1027 Newport Ave., Pawtucket, R. I.
R and L Tools, 1825 Bristol St., Philadelphia 40, Pa.
Reed Rolled Thread Die Co., P. O. Box 350, Worcester 1, Mass.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.



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National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Ottemiller, W. H., Co., York, Pa.
Standard Pressed Steel Co., Jenkintown, Pa.
Wicaco Machine Corp., Stenton Ave. and Louden St., Philadelphia, Pa.

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Cone Automatic Mch. Co., Inc., Windsor, Vt.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

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See also Lathes, Turret.

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Brown & Sharpe Mfg. Co., Providence, R. I.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Simmons Mch. Tool Corp., 1600 N. Broadway, Albany, N. Y.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

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Card, S. W., Mfg. Co., Div. Union Twist Drill Co., Mansfield, Mass.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Threadwell Tap & Die Co., 16 Arch St., Greenfield, Mass.
Winter Bros. Co., Rochester, Mich.

SCREWS, Cap, Set, Safety Set and Machine, Etc

Allen Mfg. Co., 133 Sheldon St., Hartford 2, Conn.
Allied Products Corp., 12677 Burt Rd., Detroit 23, Mich.
Bristol Co., Platts Mills, Waterbury, Conn.
Chicago Screw Co., Bellwood, Ill.
National Acme Co., 170 E. 131st St., Cleveland Ohio.
Ottemiller, W. H., Co., York, Pa.
Parker-Kalon Corp., 200 Varick St., New York 14, N. Y.
Republic Steel Corp., Bolt & Nut Div., Republic Bldg., Cleveland 1, Ohio.
Russell, Burdsall & Ward Bolt & Nut Co. 100 Midland Ave., Port Chester, N. Y.
Set Screw & Mfg. Co., 35 Main St., Bartlett, Ill.
Standard Pressed Steel Co., Jenkintown, Pa.

SCREWS, Self-Tapping, Drive

Parker-Kalon Corp., 200 Varick St., New York 14, N. Y.

SCREWS, Thumb

Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
Parker-Kalon Corp., 200 Varick St., New York 14, N. Y.
Russell, Burdsall & Ward Bolt & Nut Co., 100 Midland Ave., Port Chester, N. Y.

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(Continued on page 434)

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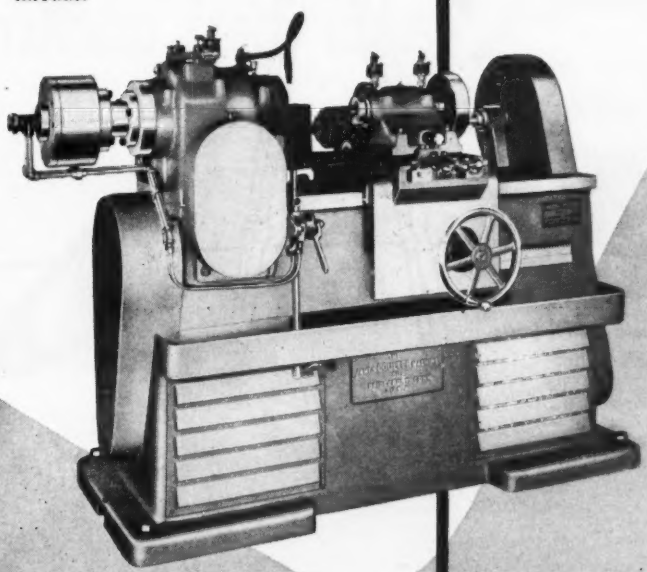

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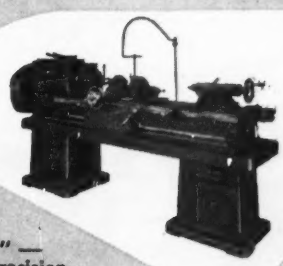

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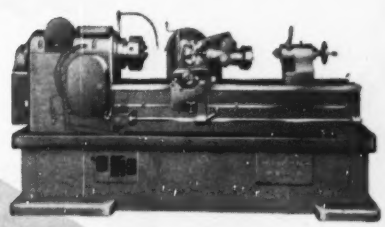

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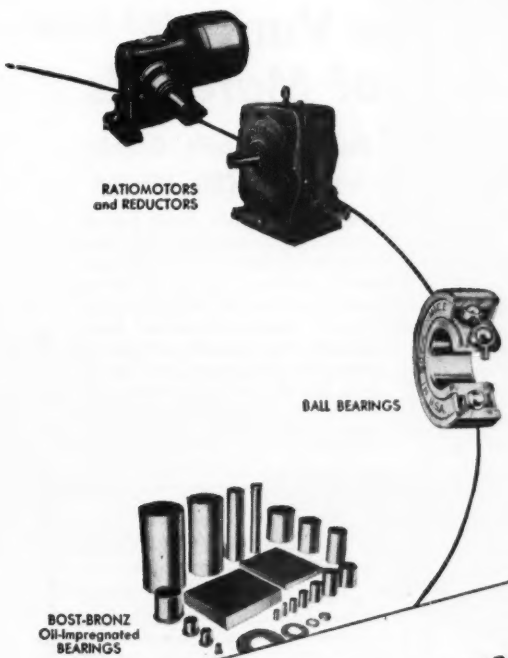

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National Acme Co., 170 E. 131st St., Cleveland Ohio.

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Bethlehem Steel Co., Bethlehem, Pa.
Cumberland Steel Co., Cumberland, Md.
De Laval Separator Co., Poughkeepsie, N. Y.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
LaSalle Steel Co., Hammond, Ind.
Republic Steel Corp., Union Drawn Steel Div., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St. Chicago 18, Ill.
Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.
Summerill Tubing Co., Div. Columbia Steel & Shafting Co., P. O. Box 1557, Pittsburgh 30, Pa.

SHAFTS

National Forge & Ordnance Co., Irvine, Warren County, Pa.
Standard Pressed Steel Co., Jenkintown, Pa.
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SHAFTS, Turned and Ground

Bethlehem Steel Co., Bethlehem, Pa.
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Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
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National Forge & Ordnance Co., Irvine, Warren County, Pa.
Republic Steel Corp., Union Drawn Steel Div., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
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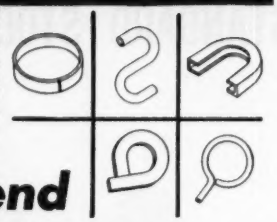
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Hend.y Machine Co., Inc., Torrington, Conn.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Morton Mfg. Co., Muskegon Heights, Mich.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Orban, Kurt, Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Sheldon Mch. Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

(Continued on page 436)



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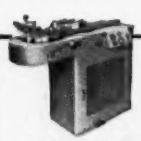

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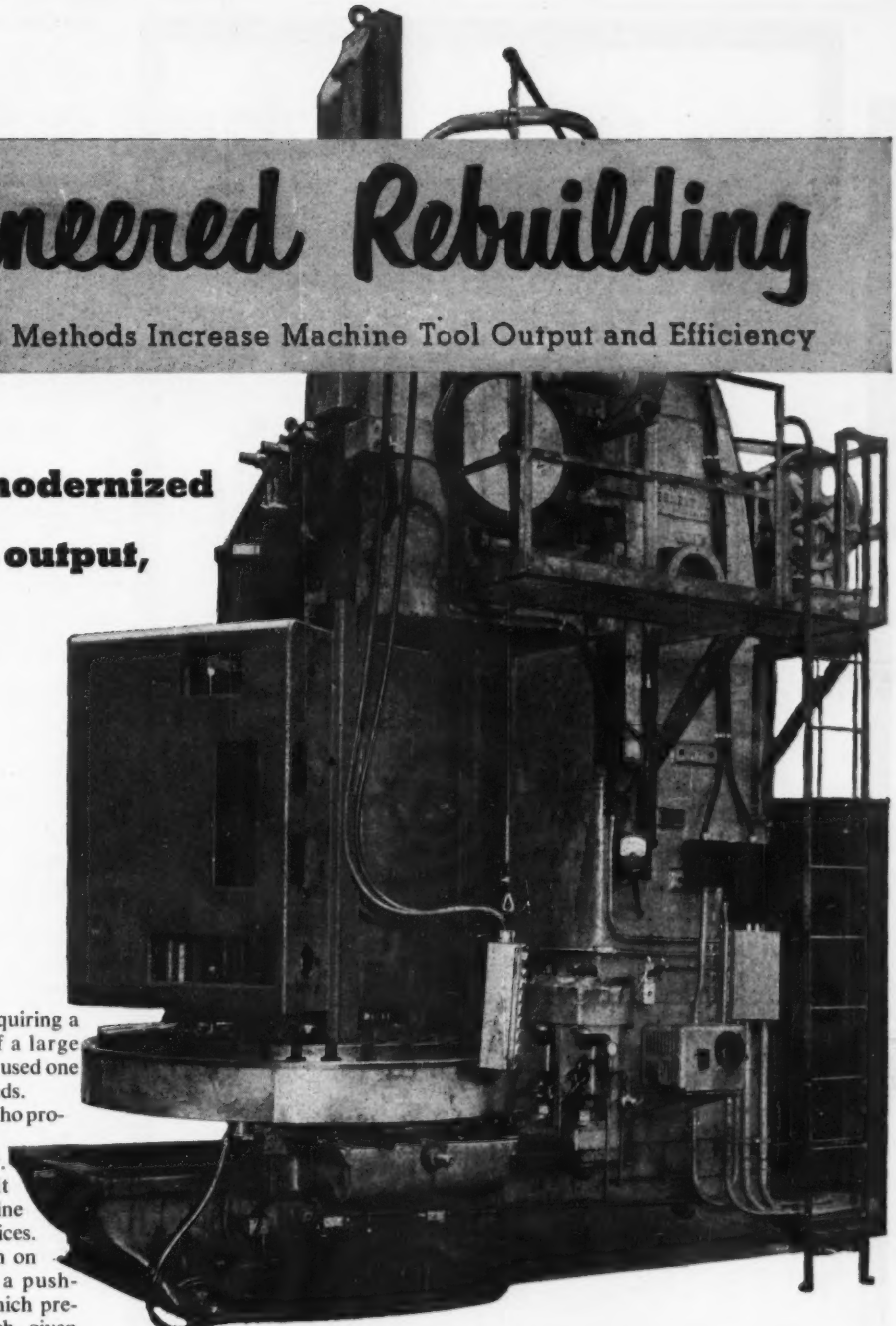

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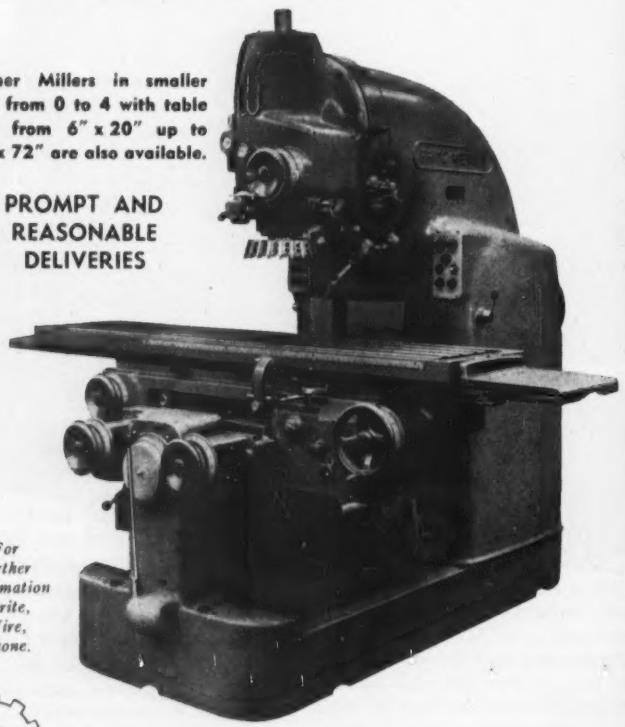

For further information Write, Wire, Phone.

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British Industries Corp., International Mchry. Div., 164 Duane St., New York, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.

SHAPES, Cold Drawn Steel

Columbia Steel & Shafting Co., P. O. Box 1557, Pittsburgh 30, Pa.
Summerill Tubing Co., Div. Columbia Steel & Shafting Co., P. O. Box 1557, Pittsburgh 30, Pa.

SHAPES, Structural

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
U. S. Steel Corp. (Carnegie-Illinois Steel Corp. Div., Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.

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Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
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Ferracute Machine Co., Bridgeton, N. J.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Morgan Engrg. Co., Alliance, Ohio.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
O'Neil-Irwin Mfg., Lake City, Minn.
Peck, Stow & Wilcox Co., Southington, Conn.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J
Yoder Co, 550 Walworth Ave., Cleveland, Ohio.

SHEARS, Alligator

Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.

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Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Peck, Stow & Wilcox Co., Southington, Conn.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co. (Knives), 470 Main St., Fitchburg, Mass.
Union Twist Drill Co., Athol, Mass.

SHEARS, Squaring

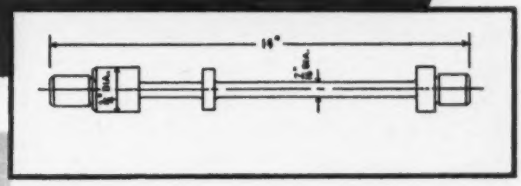
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Peck, Stow & Wilcox Co., Southington, Conn.
Simonds Saw & Steel Co. (Blades), 470 Main St., Fitchburg, Mass.

SHEET METALS

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.
American Brass Co., 25 Broadway, New York, N. Y.
Bethlehem Steel Corp., Bethlehem, Pa.
Chase Brass & Copper Co., Inc., 1949 Rodney St., Waterbury 20, Conn.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.
U. S. Steel Corp. (Carnegie-Illinois Steel Corp. Div., Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.

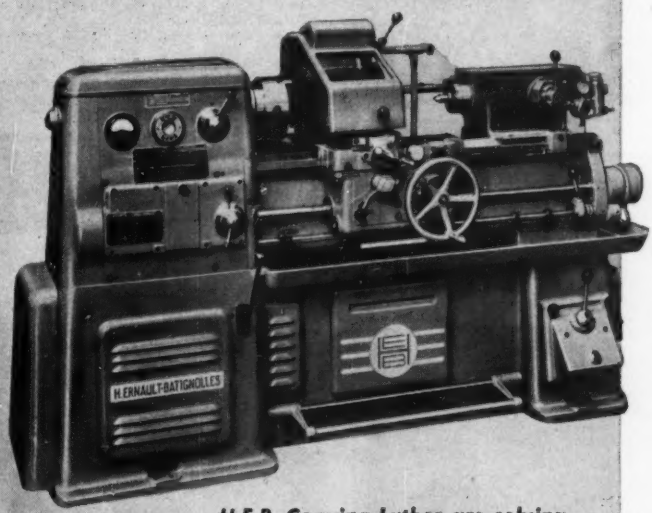
(Continued on page 438)

Got a tough turning problem?



HIGH SPEED HYDRAULIC Copying Lathes

will show you how easy it can be!



H.E.B. Copying Lathes are solving turning problems in these plants:

- Acromatic Tool Company
- Beaver Precision Products, Inc.
- Buick Division, General Motors Corp.
- De Laval Separator Co.
- East Coast Aeronautics, Inc.
- Electrol, Inc.
- Fox River Ordnance Plant
- Harvey Machine Tool Company
- Manufacturers Tool & Gauge Co.

. . . AND MANY OTHERS!

- **Slash production time**
- **Produce better finish and closer tolerances**

We'd like to make your troublesome jobs easy. *SEND US A PRINT OF YOUR MOST DIFFICULT TURNING JOB* for analysis by our engineering staff! We think we can prove to you that the H.E.B. is "*The* Way to Turn!" There's no charge or obligation, of course.

That spindle you see in the drawing has actually been *copy*-turned on the H.E.B. in just 2.1 minutes floor-to-floor time, machined from SAE 1040 . . . and every copy-turned part is identical.

Rigidly constructed H.E.B. Copying Lathes – **OP** Model, with built-in tracer device and 20 H.P. motor take heavy cuts with carbide tools at spindle speeds up to 3600 RPM. **GT** Models with rotating pattern are designed for copying irregular, non-circular work. Great for short runs as well as large scale production because setup time is only about 20 minutes!

Ask for a demonstration *now* or for detailed literature – Study our insert in Sweet's Machine Tool catalog!

IMMEDIATE DELIVERY

H·E·B

"THE WAY TO TURN"

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COPYING LATHES • ENGINE LATHES WITH COPYING ATTACHMENTS • TOOL ROOM LATHES • CARBIDE TOOL GRINDERS

SHEETS, Iron and Steel

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Corp., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp. (Carnegie-Illinois Steel Corp. Div., Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.

SHIMS

Laminated Shim Co., Inc., Glenbrook, Conn.

SLEEVES

Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.

SLOTTING MACHINES

Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Lobdell United Co., 2000 "G" St., Wilmington 99, Del.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.

SOCKETS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.

SPECIAL MACHINERY AND TOOLS

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Bath, Cyril, Co., 6984 Machinery Ave., Cleveland 3, Ohio.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Bethlehem Steel Co., Bethlehem, Pa.
Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.
Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.
Blanchard Mch. Co., 64 State St., Cambridge, Mass.
Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.
Chambersburg Engineering Co., Chambersburg, Pa.
Colonial Broach Co., Detroit 13, Mich.
Columbus Die-Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Coulter, James, Machine Co., 629 Railroad Ave., Bridgeport 5, Conn.
Douglas Tool Co., 2300 E. Nine Mile Rd., Hazel Park, Mich.
Espen-Lucas Mch. Works, Front St. and Girard Ave., Philadelphia, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Grant Mfg. & Mch. Co., 90 Silliman St., Bridgeport 5, Conn.
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Jahn, B., Manufacturing Co., Ellis St., New Britain, Conn.
Kingsbury Mch. Tool Corp., Keene, N. H.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Mathewson Machine Works, Inc., 28 Hancock St., Quincy 71, Mass.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Moline Tool Co., 102 20th St., Moline, Ill.
Morgan Engrg. Co., Alliance, Ohio.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tool Co., Rochester, Mich.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4 Wis.
OK Tool Co., Milford, N. H.
Pioneer Engrg. & Mfg. Co., 19679 John R St., Detroit, Mich.
Pioneer Pump & Mfg. Co., 19679 John R St., Detroit, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.
Union Twist Drill Co., Athol, Mass.
Universal Engineering Co., Frankenmuth 2, Mich.
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.
Walker Hydraulic Duplicator Co., Box 200, Standish, Mich.
Waltham Machine Works, Newton St., Waltham, Mass.
Wicaco Machine Corp., Stenton Ave. and Louden St., Philadelphia, Pa.
Zagar Tool Co., 24000 Lakeland Blvd., Cleveland 23, Ohio.

SPEED REDUCERS

Atlantic Gear Works, Inc., 200 Lafayette St., New York 12, N. Y.
Boston Gear Works, 3200 Main St., North Quincy 71, Mass.
Brad Foote Gear Works, 1309 S. Cicero Ave., Cicero 50, Ill.
Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland, Ohio.
Cone-Drive Gears, Div. Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
General Electric Co., Schenectady, N. Y.
Link-Belt Co., 2045 W. Huntington Park Ave., Philadelphia 40, Pa.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Perkins Mch. & Gear Co., Box 1611, Springfield 2, Mass.
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.
Twin Disc Clutch Co., 1361 Racine St., Racine, Wis.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

SPINDLES, Grinding

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Pope Mchry. Corp., Haverill, Mass.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

(Continued on page 440)

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DIAMOND WHEELS
NOT the final chapter . . .
But do you realize that as a result of constant research, Secomet Diamond Wheels will now grind FORTY times the amount of carbide than a similar wheel of ten years ago.
Keep this statement in mind when you are about to place that next Diamond Wheel order.
Incidentally, our new Diamond Wheel Catalog #52 will be sent to you immediately upon request.
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J. K. SMIT & SONS, INC.
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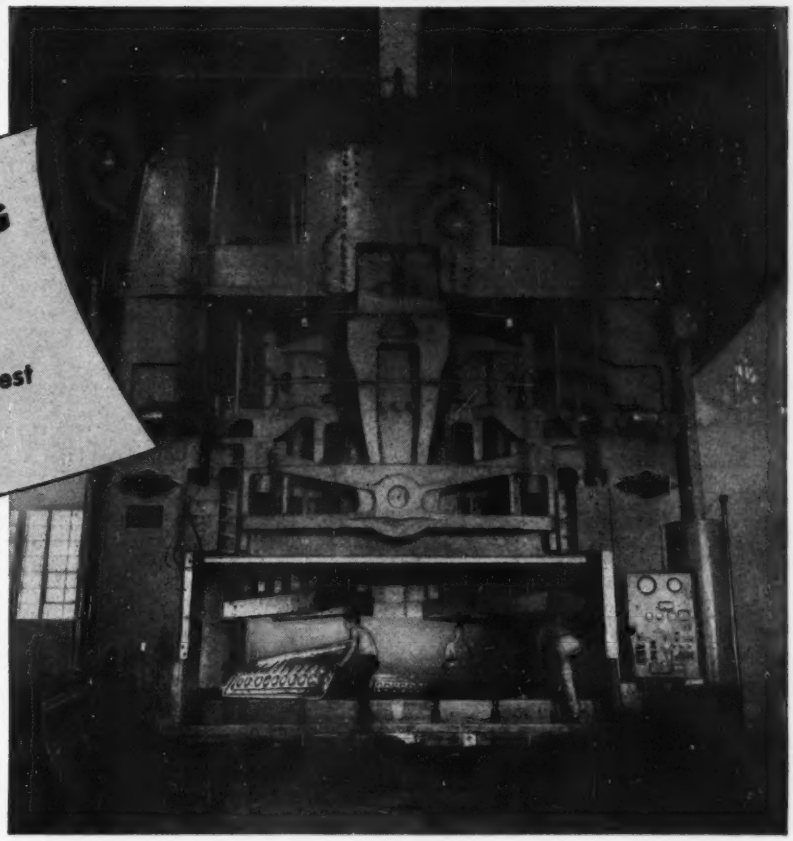
IT'S HAPPENING TODAY AT LOCKHEED

with the world's largest press of its kind!

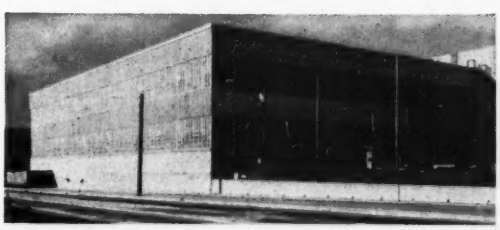


Exerting 16,000,000 lbs. pressure, this 8,000 ton press is forming plane sections up to 10 x 30 ft. in 1/2 in. aluminum.

BIRDSBORO

hydraulic press

Lockheed Aircraft Corporation is now able to produce larger individual parts with heavier sections of new, tougher metals demanded by tomorrow's high speed aircraft. And Lockheed is doing it with this new 8,000-ton hydraulic press designed and built by BIRDSBORO. Largest of its kind in the world, this huge machine has a total height of 48 feet of which 12 feet is foundation embedded in the floor. The operator of this giant press controls a force equivalent to the weight of a battle cruiser as he forms components of tough aluminum alloy a half-inch thick and up to ten by 30 feet in size.



The new Birdsboro Hydraulic Press takes its place in Lockheed's "Hall of Giants", housing a multimillion dollars worth of heavy-duty production machinery.

Agents In:
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BIRDSBORO

BIRDSBORO STEEL FOUNDRY & MACHINE CO., BIRDSBORO, PENNA.

HYDRAULIC PRESSES

HPL 2-53

Offices in Birdsboro, Pa. and Pittsburgh, Pa.

designers and builders of: Hydraulic Presses • Steel Mill Machinery • Crushing Machinery • Rolls • Special Machinery • Steel Castings

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See Chucking Machines.

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Atlantic Gear Works, Inc., 200 Lafayette St., New York 12, N. Y.
Boston Gear Works, 3200 Main St., North Quincy 71, Mass.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.

SPROCKETS

Atlantic Gear Works, Inc., 200 Lafayette St., New York 12, N. Y.
Boston Gear Works, 3200 Main St., North Quincy 71, Mass.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.

STAMPINGS, All Metal

LaSalle Steel Co., Hammond, Ind.

STAMPINGS, Sheet Metal

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.
Laminated Shim Co., Inc., Glenbrook, Conn.
Republic Steel Corp., Niles Steel Products Div., Republic Bldg., Cleveland 1, Ohio.
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

STAMPS, Steel and Marking Dies

Hoggson & Pettis Mfg. Co., 149 Brewery St., New Haven, Conn.

STEEL

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Frasse, Peter A., & Co., Inc., 17 Grand St., New York 13, N. Y.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
National Forge & Ordnance Co., Irvine, Warren County, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.
Summerill Tubing Co., Div. Columbia Steel & Shafting Co., P. O. Box 1557, Pittsburgh 30, Pa.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp. Div., Columbia Steel Co., Div. Tennessee Coal, Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.
U. S. Steel Supply Div., U. S. Steel Co., 208 S. LaSalle St., Chicago 4, Ill.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, Cold Drawn

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
LaSalle Steel Co., Hammond, Ind.
Republic Steel Corp., Union Drawn Steel Div., Massillon, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.
Summerill Tubing Co., Div. Columbia Steel & Shafting Co., P. O. Box 1557, Pittsburgh 30, Pa.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp. (American Steel & Wire Co. Div.), 436 7th Ave., Pittsburgh, Pa.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, High Speed Tool

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.
Vanadium Alloys Steel Co., Latrobe, Pa.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, Lead-Bearing

Inland Steel Co., 38 S. Dearborn St., Chicago 3, Ill.

STEEL, Machine

Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
LaSalle Steel Co., Hammond, Ind.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.
Timken Roller Bearing Co., Canton, Ohio.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, Stainless

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Frasse, Peter A., & Co., Inc., 17 Grand St., New York 13, N. Y.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp. Div.), 436 7th Ave., Pittsburgh, Pa.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, Strip and Sheet

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Frasse, Peter A., & Co., Inc., 17 Grand St., New York 13, N. Y.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.
U. S. Steel Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp. Div., Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.

(Continued on page 442)

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Shaved Semi-hardened Helical Gear for High-speed Blower

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THE CINCINNATI GEAR COMPANY
"Gears . . . Good Gears Only"
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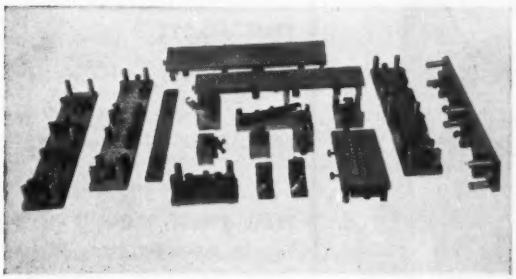
YOU GET *SPEED* PLUS ACCURACY WITH MOORE JIG BORERS

IN THE TOOLROOM

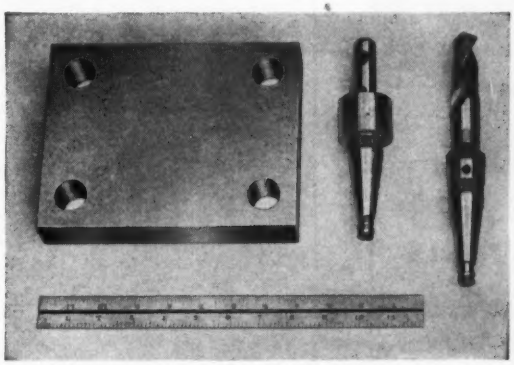
400 holes to "tenths"—5 to 7 minutes each on the No. 1 Moore Jig Borer



Manufacture of this group of drill jigs involves accurately locating, drilling and boring approximately 400 holes. The No. 1 Moore Jig Borer finished them to "tenths" in from five to seven minutes per hole.

ON PRODUCTION

64 holes to ±.0002"—2 minutes each on the No. 2 Moore Jig Borer

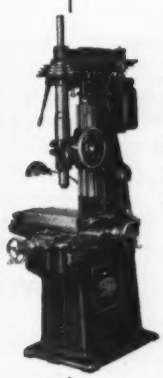


Sixteen pieces like this were located, drilled, bored and checked on a No. 2 Moore Jig Borer with one drill and one carbide bit. The 64 holes were finished in 2 hours and 8 minutes (plus 30 minutes setup) with location and size tolerances ± .0002".

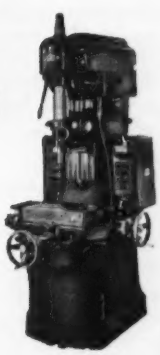
Only a precision machine geared to the high American production standards of ruggedness *and* accuracy can meet these performance requirements. For versatility and speed in spotting, drilling, reaming, boring and checking operations in production as well as tooling, no other moderately-priced machine tool compares with the Moore Jig Borer. And there's no sacrifice of accuracy for speed, since the lead screw measuring system built into each Moore machine permits working to the closest of tolerances.

You'll find that the Moore Jig Borer can pay for itself—*in jig time*. Write today for detailed bulletins.

Moore Special Tool Company, Inc.
734 Union Avenue, Bridgeport 7, Conn.



NO. 1 MOORE JIG BORER
Table working surface of 10"x16". Over 1200 now in use throughout the world. The ideal small, accurate jig borer. Lead screws accurate to .0002" in 16".



NO. 2 MOORE JIG BORER
Table working surface of 10"x19". Heavier cuts, larger holes. Features infinitely variable spindle speeds, three power feed ratios, centralized control panel.

ADD MOORE TOOLS TO YOUR TOOLROOM

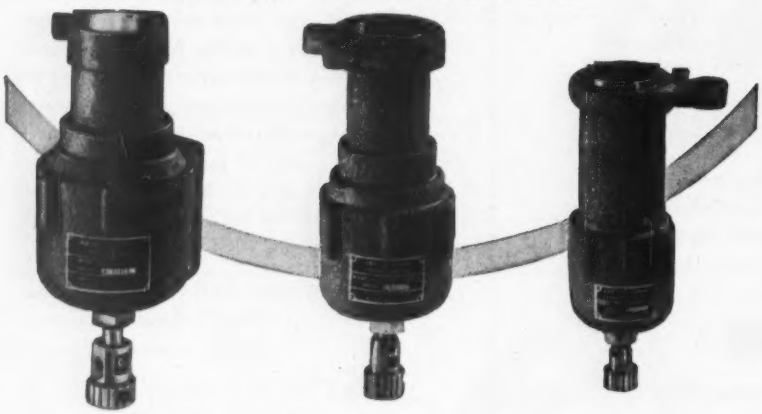
JIG BORERS · JIG GRINDERS · PANTO-CRUSH WHEEL DRESSERS · DIE FLIPPERS · MOTORIZED CENTERS · HOLE LOCATION ACCESSORIES

see our catalog in MACHINE TOOL CATALOGS or write for copy

It's 3 to 1 a Jarvis TORQOMATIC

can do your tapping jobs better

AN INDUSTRIAL MACHINE FOR INDUSTRIAL USERS



A complete range of Jarvis Torqomatics—available to fit any type drill press or tapping machine.

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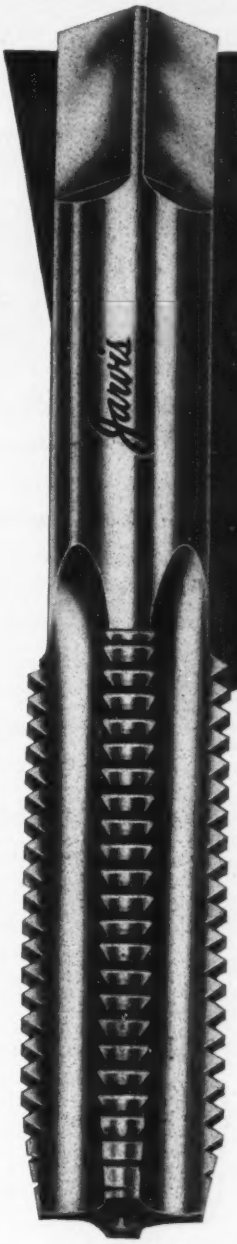
(Continued on page 444)



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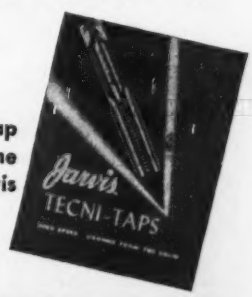

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(Continued on page 446)

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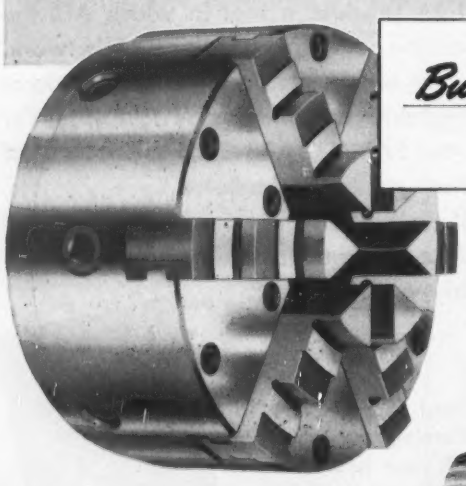

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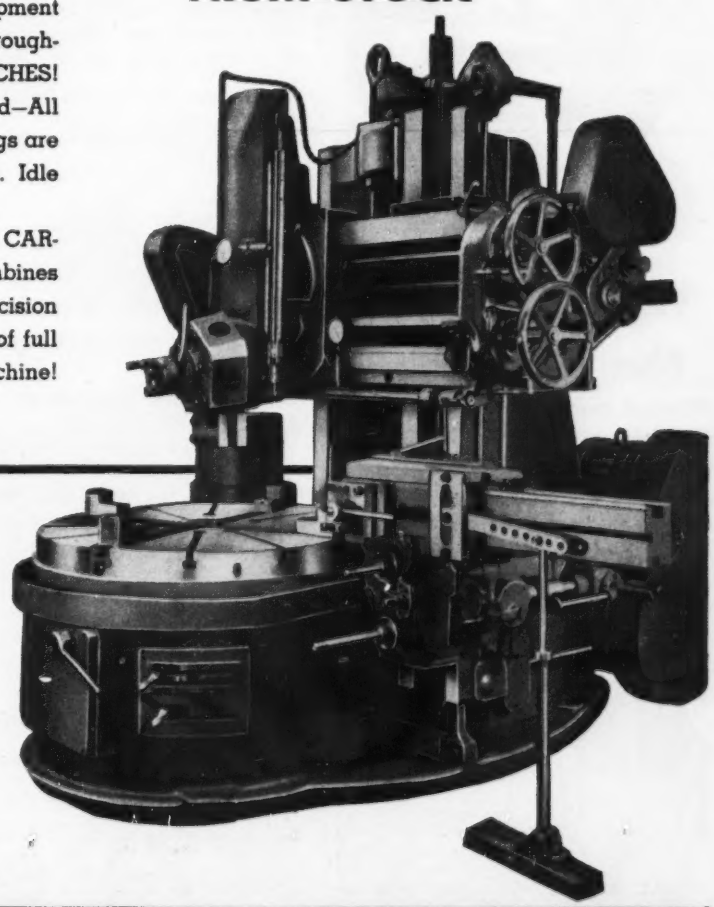

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	41"	55"
Swing with side head in position	41"	57"
Swing with side head below table	51"	57"
Vertical travel of ram	31"	23½"
Horizontal travel, side head	19½"	27½"
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Geometric Tool Co., Westville Station, New Haven 15, Conn.
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See Grinding Machines, Thread.

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Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.

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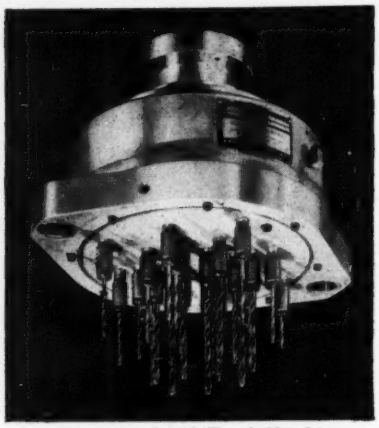

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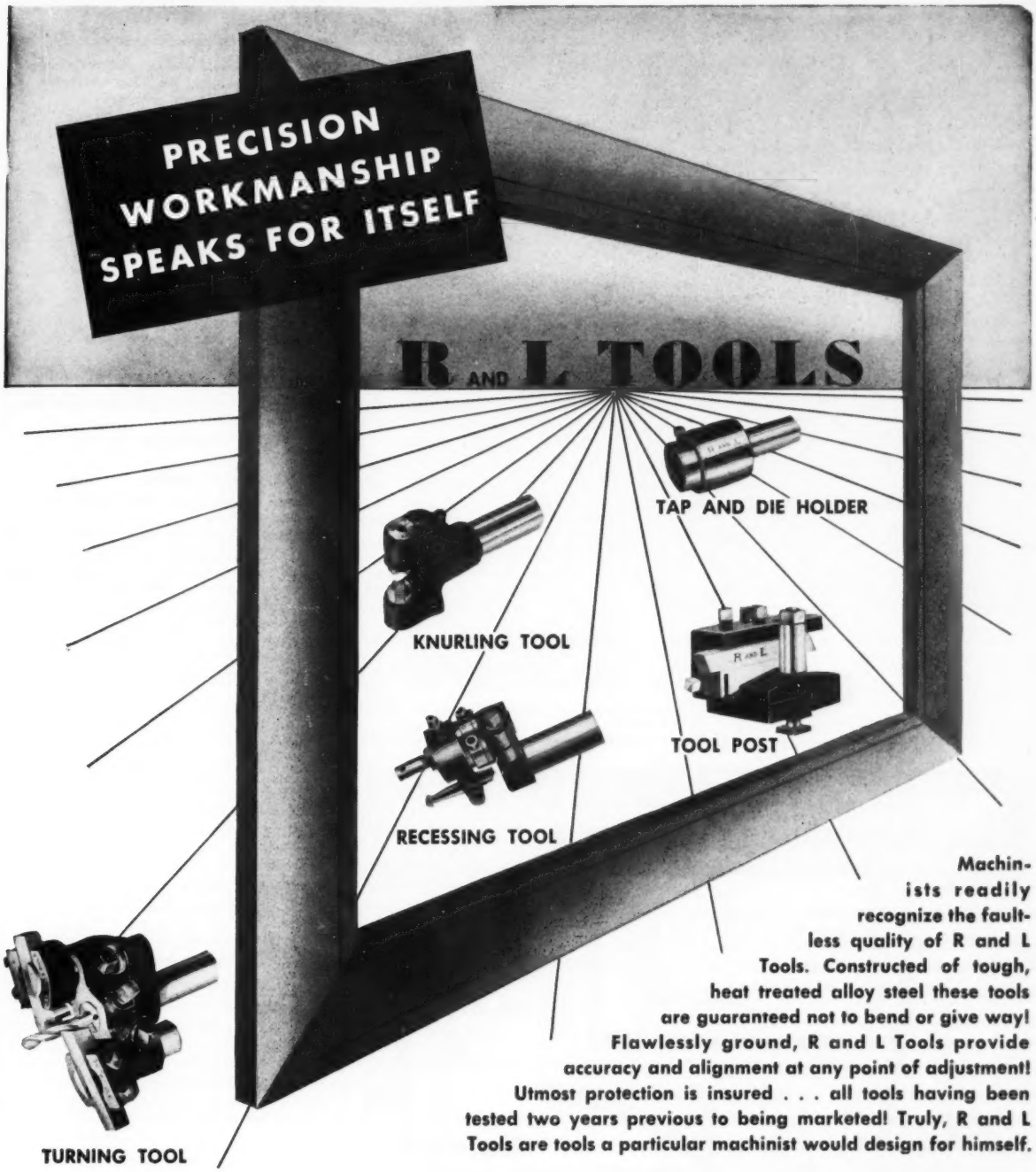

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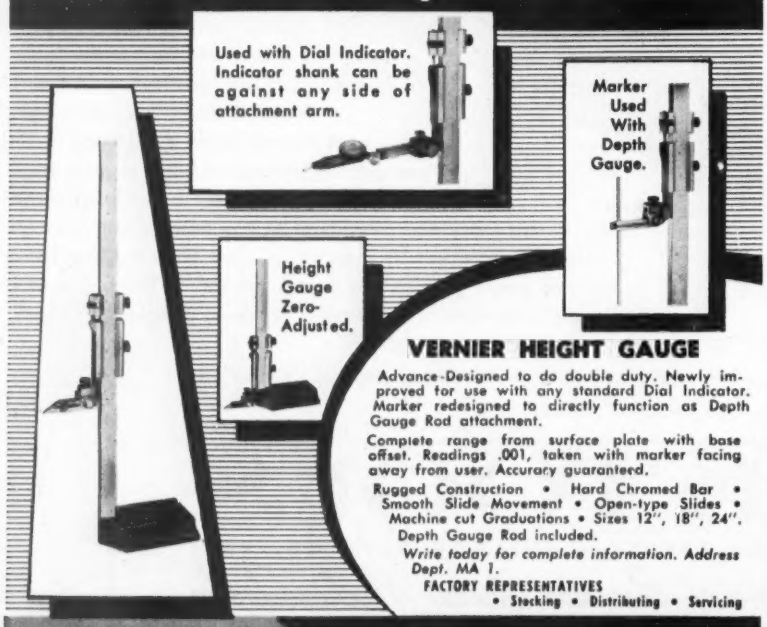
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Carpenter Steel Co., Reading, Pa.

Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.

Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.

Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.

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Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.

Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.

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Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.

Kennametal, Inc., Latrobe, Pa.

Maxwell Co., 420 Broadway, Bedford, Ohio.

McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.

Metal Carbides Corp., Youngstown, Ohio.

Morse Twist Drill & Mch. Co., New Bedford, Mass.

Precise Products Corp., 1328-30 Clark St., Racine, Wis.

Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.

Union Twist Drill Co., Athol, Mass.

Wesson Metal Corp., Lexington, Ky.

Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

TOOLS, Lathe, Shaper and Planer

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

Bullard Co., Brewster St., Bridgeport 2, Conn.

Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.

Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.

Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.

Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.

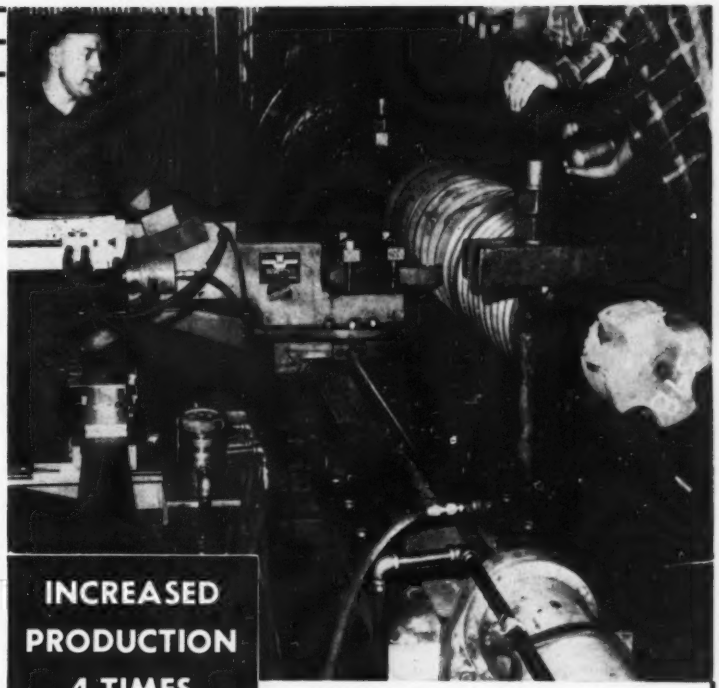
Kennametal, Inc., Latrobe, Pa.

Lovejoy Tool Co., Inc., Springfield, Vt.

Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.

(Continued on page 450)

TRACER CONTROLLED MACHINING APPLIED TO ROLL LATHES



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WALKER—As you say, the roll maker has definitely established the fact that the only true surfaces on their rolls are those turned from the journals. To insure accuracy the engine lathe user has to redress the centers, requiring extra time to perform this separate operation. On some rolls they can do the job in half the time but most rolls must be made on a roll lathe with a forming tool in order to get the needed glass-like finishes that are desired.

On one typical application (shown), a **WALKER TRACER CONTROLLED MACHINE** turned rolls 4 times faster than had been possible previously. YOUR present roll lathes can be modernized with a **WALKER DUPLICATOR** in your own plant to take advantage of the higher cutting speeds of cemented carbides—at a tremendous saving to you—about 1/6th the cost of a new lathe equipped with duplicator.

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WALKER DUPLICATORS locate the tool and tracer on the front of the machine so that the operator has complete view, control and adjustment in front of him at all times.

WALKER DUPLICATORS are simple in operation, easy to understand, accurate beyond question, and can be easily disengaged. No mirrors, relays, switches, air valves or clutches—only simple hydraulics that have been proven in operation for 20 years.

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Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.

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Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

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Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.

Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

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Grant Mfg. & Mch. Co., 90 Silliman St., Bridgeport 5, Conn.

TUBE FORMING AND WELDING MACHINES

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Yoder Co., 550 Walworth Ave., Cleveland, Ohio.

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Chase Brass & Copper Co., Inc., 1949 Rodney St., Waterbury 20, Conn.

Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

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American Metal Hose Br. American Brass Co., 25 Broadway, New York, N. Y.

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Carpenter Steel Co., Reading, Pa.

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Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.

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Wood, R. D., Co., Public Ledger Bldg., Philadelphia 5, Pa.

VIBRATION INSULATION

American Felt Co, Glenville, Conn.

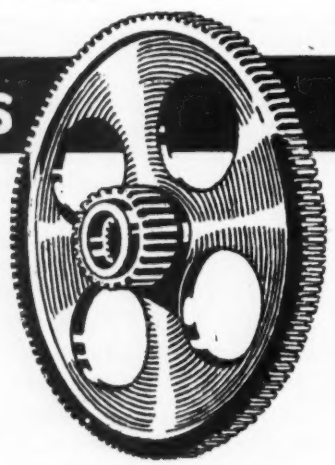
VISES, Machine

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

(Continued on page 452)

Mass. Gears



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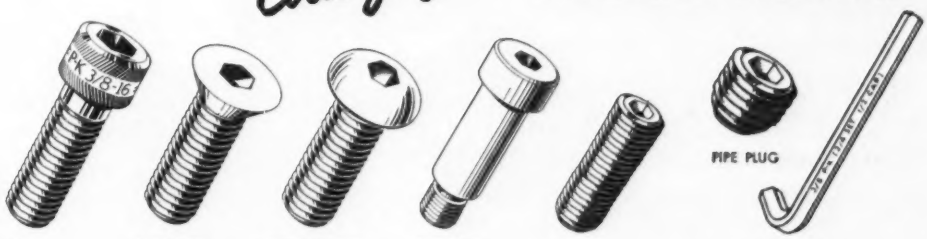

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Homestrand, Inc., Larchmont, N. Y.

Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.

Martin, J. E. Mch. Works, 548 W. State St., Springfield, Ohio.

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Mathewson Machine Works, 28 Hancock St., Quincy 71, Mass.

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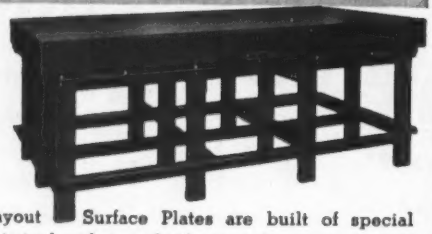

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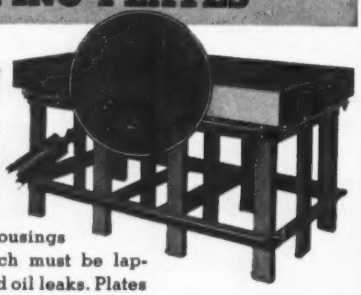

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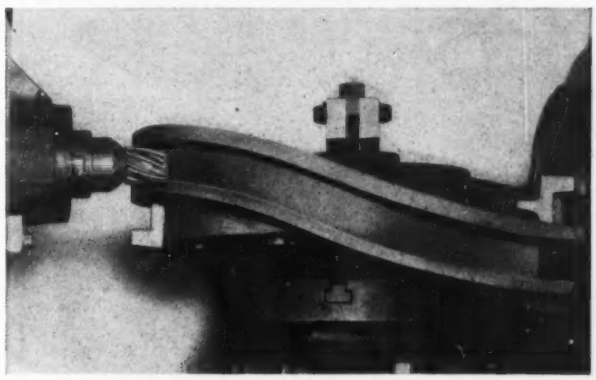

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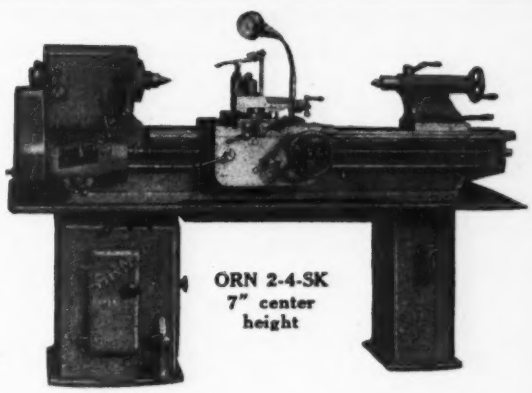

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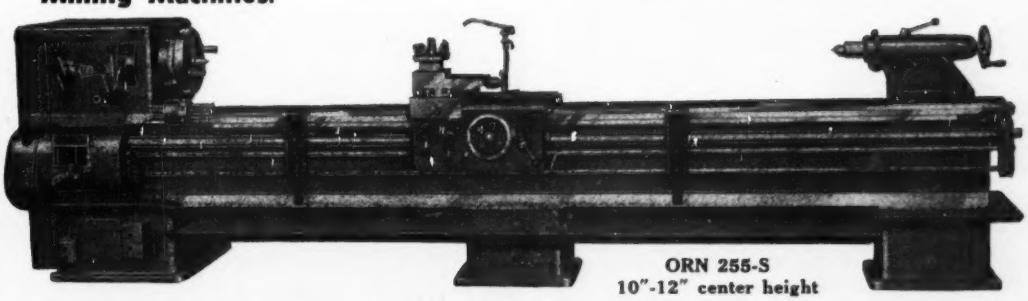

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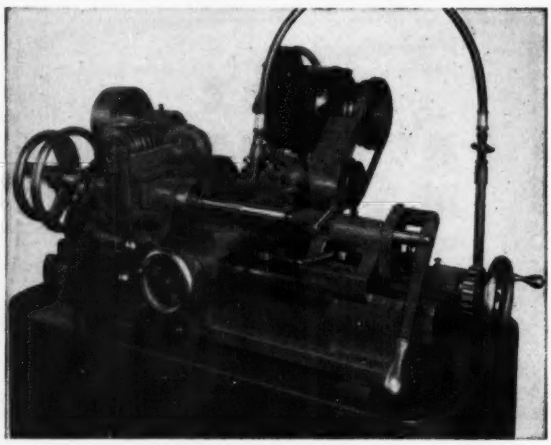

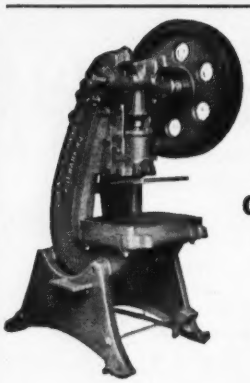

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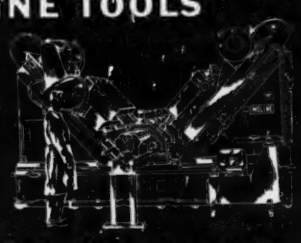

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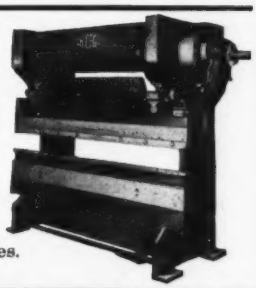

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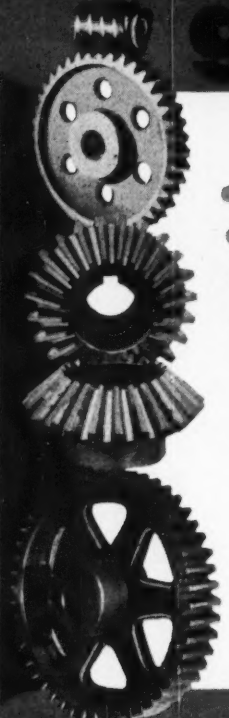

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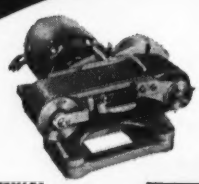

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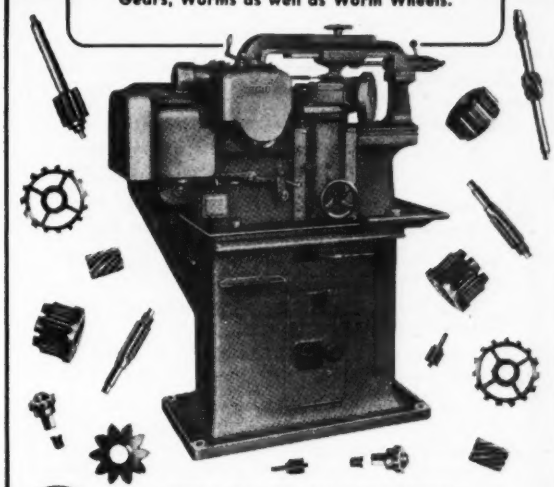

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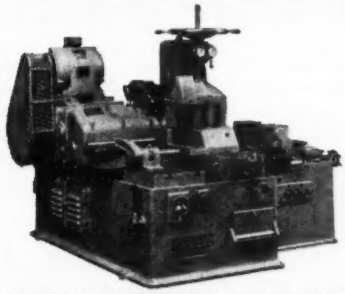

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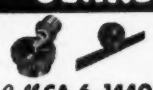

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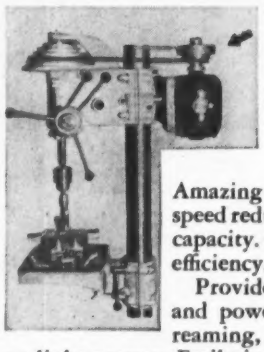

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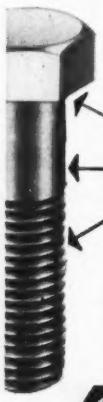

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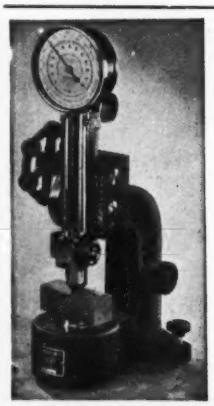

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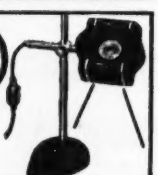

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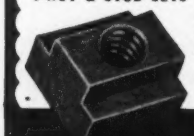

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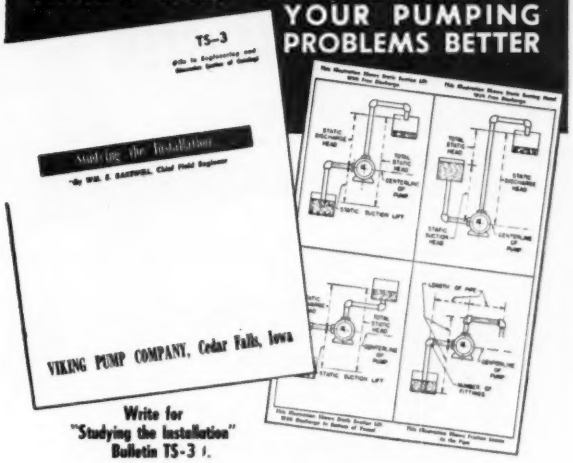

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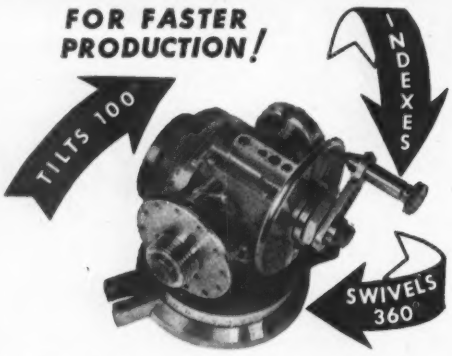

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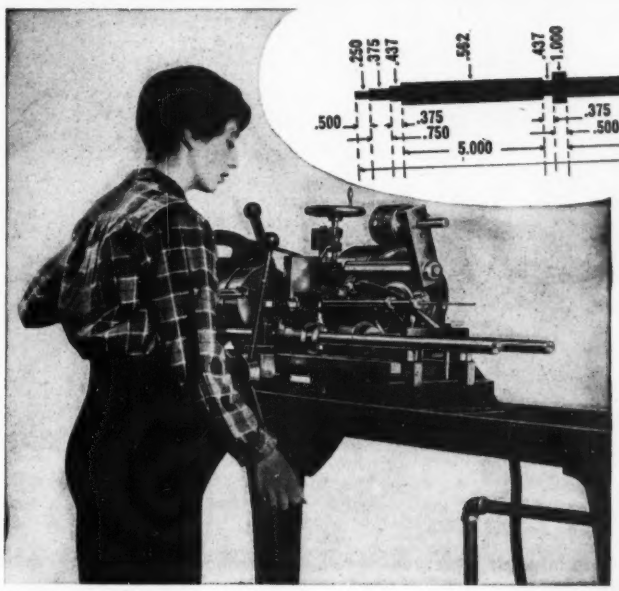

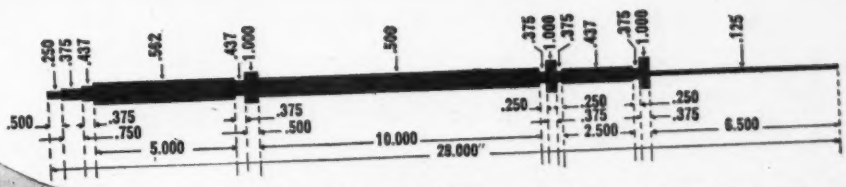

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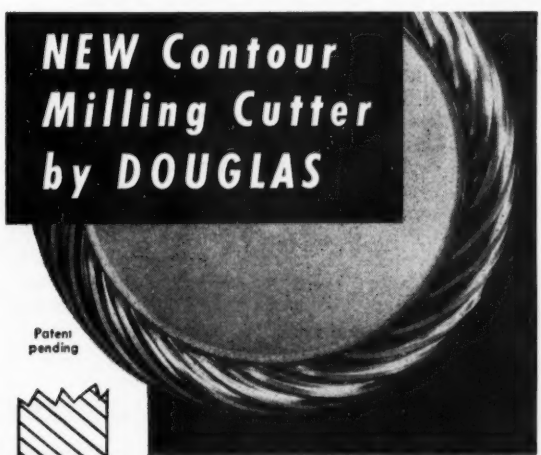

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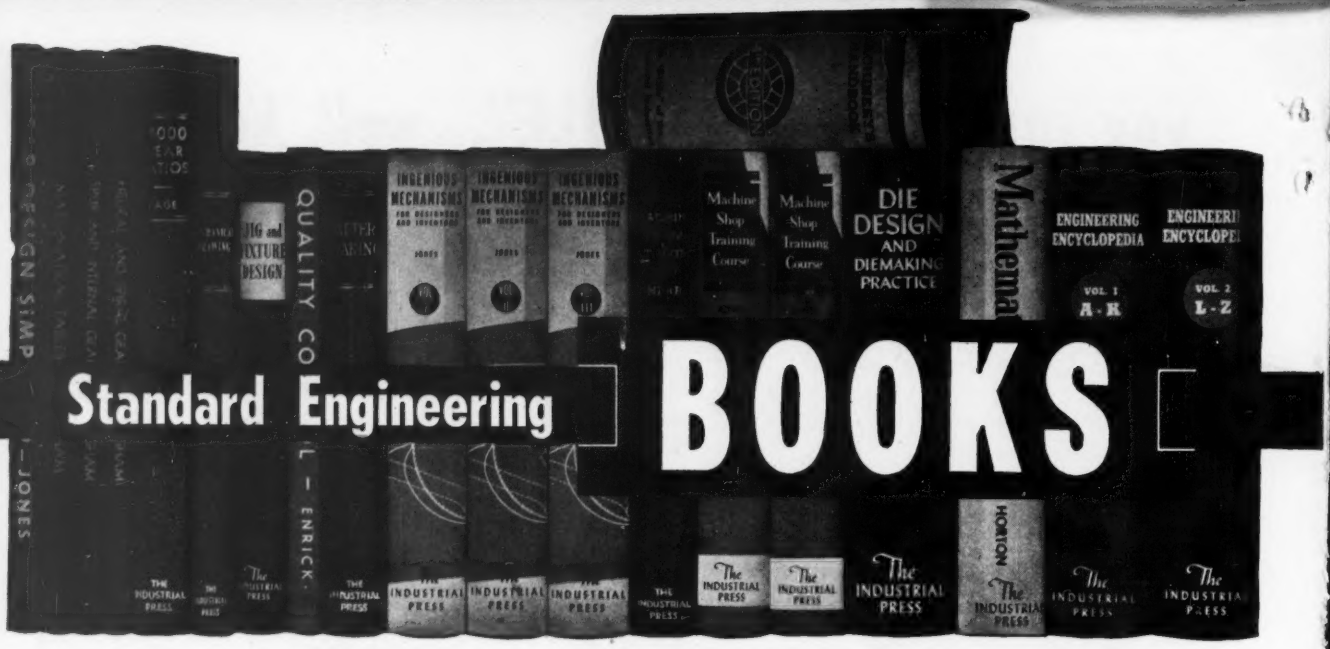

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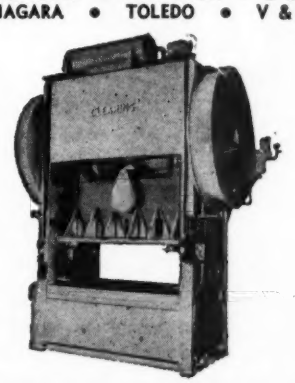

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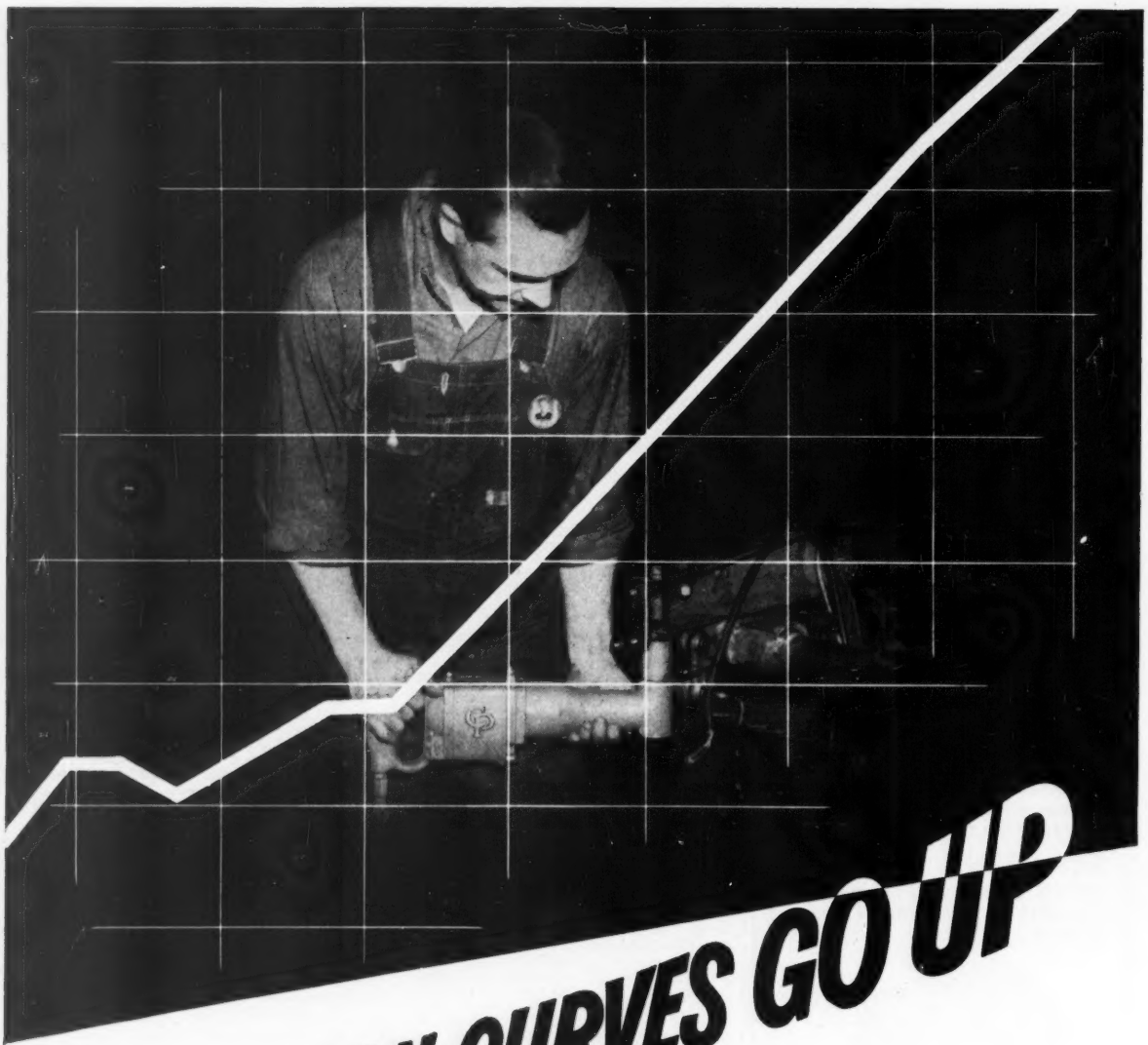

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Three Cleveland 10RT speed reducers (with 3" centers) on a six cylinder gang pump installed in a California oil plant. Two of the worm gear units drive pumps at 88 strokes per minute, the third at 70 strokes per minute. Photo by courtesy of Milton Roy Company.

Small CLEVELANDS provide wide range of stroking speeds for Milton Roy pumps

THIS Milton Roy controlled volume pump meters 3 liquids in exact ratio—fatty acid, sulphuric acid, and glycerin, delivered at differing speeds.

To provide the variation of stroking speeds necessary and to insure accurate control of proportioning and volume, the pump builder uses three small Cleveland worm gear reducers with a variable speed motor.

Cleveland worm gear units take up a minimum of space. They transmit power with a smooth, uniform torque flow. Case-hardened steel worms mesh with nickel-bronze gears for long, hard, dependable service without appreciable wear. Throughout the chemical and allied industries, you'll find Clevelands—big and small—driving pumps, agitators, mixers—in fact, every kind of equipment for which a right-angle drive is needed.

If you have a power transmission problem, you can get help by writing for Catalog 400. The Cleveland Worm & Gear Company, 3276 East 80th St., Cleveland 4, Ohio.

Affiliate: The Farval Corporation, Centralized Systems of Lubrication. In Canada: Peacock Brothers Limited.

Does 98 operations every 1.1 minutes with help of 216 TIMKEN® bearings

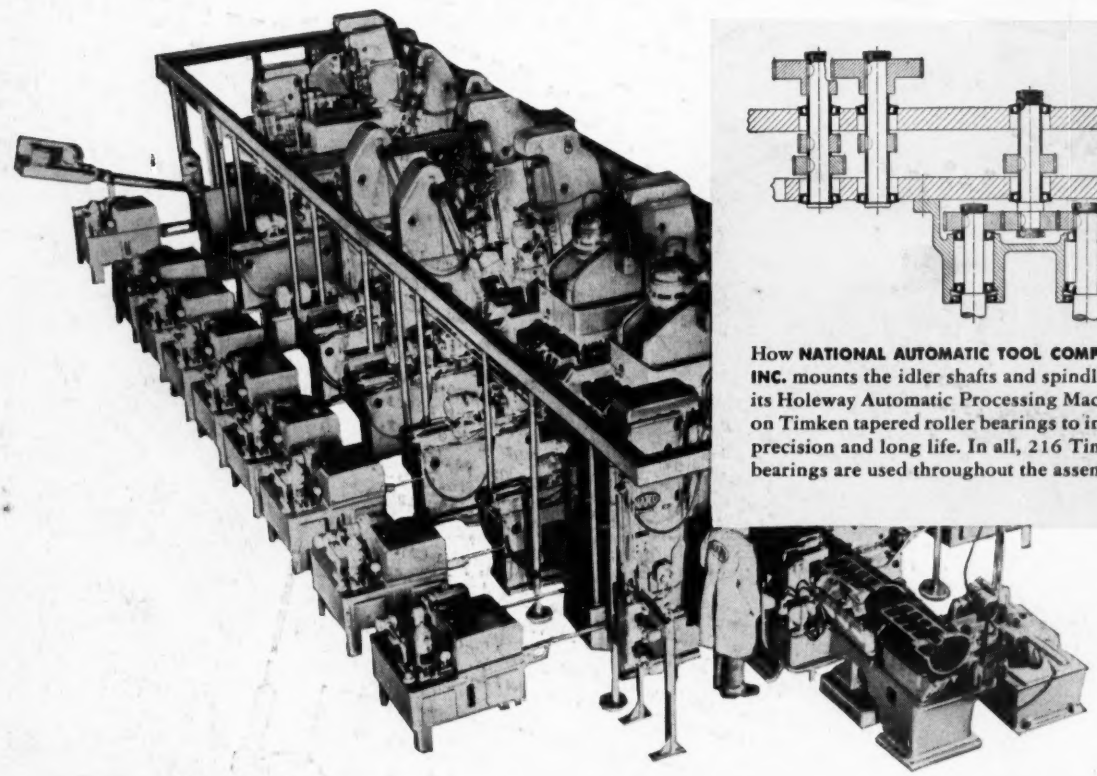
THIS Natco Holeway Automatic processing machine completes 98 pan face operations on an engine block every 1.1 minutes! Besides milling, drilling, trepaning, counterboring, reaming and chamfering, it automatically inspects the finished block! To insure precision and long life, National Automatic Tool Company, Inc. mounts the idler shafts and spindles on Timken® tapered roller bearings, and uses a total of 216 Timken bearings throughout the assembly.

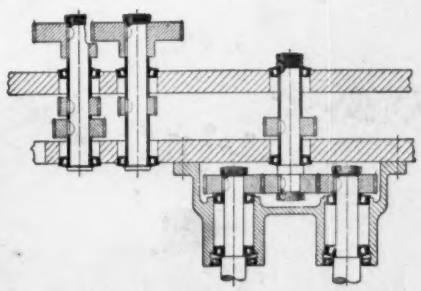
Because of their tapered construction, Timken bearings take radial and thrust loads in *any* combination. And line contact between rollers and races gives them extra load-carrying capacity. Shafts are held in rigid alignment. Gears mesh smoothly and accurately.

The true rolling motion and incredibly smooth finish of Timken bearings practically eliminates friction. They hold shafts and housings concentric, making closures more effective. Lubrication time and material costs are cut.

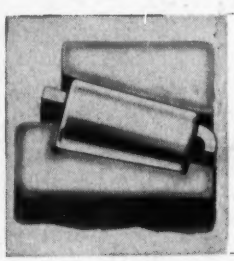
Timken bearings are engineered for the job, precision manufactured, and made of special analysis Timken fine alloy steel. Normally, they last the life of the machine. No other bearing can give you all the advantages you get with Timken tapered roller bearings. Specify them in the machines you build or buy. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.





How **NATIONAL AUTOMATIC TOOL COMPANY, INC.** mounts the idler shafts and spindles of its Holeway Automatic Processing Machine on Timken tapered roller bearings to insure precision and long life. In all, 216 Timken bearings are used throughout the assembly.



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The Timken Roller Bearing Company is the acknowledged leader in: 1. advanced design; 2. precision manufacturing; 3. rigid quality control; 4. special analysis steels.

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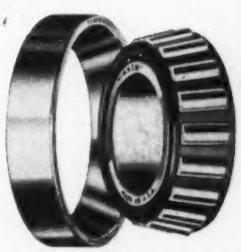

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